

Delaware's Phase II Chesapeake Bay Watershed Implementation Plan



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ASSEMBLED BY:

DELAWARE'S CHESAPEAKE INTERAGENCY WORKGROUP

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SECTION 1. EXECUTIVE SUMMARY

Delaware has participated in the Chesapeake Bay Program since signing a multi-jurisdictional Memorandum of Understanding in 2000, committing to achieving water quality goals to protect and improve the Bay and tributary waters. Since past Chesapeake Bay Program restoration goals have yet to be met, on May 12, 2009, President Obama signed Executive Order 13508, placing increased focus and heightened emphasis on Bay restoration. In addition, draft legislation to reauthorize the Chesapeake Bay Program, calls for increased measures from federal, state, and local governments. Before both of these initiatives began, however, EPA had already begun developing a Total Maximum Daily Load (TMDL) for nitrogen, phosphorus, and sediment for the entire six-state and DC Chesapeake Bay watershed because water quality impairments had been documented for decades. This TMDL will require significant reductions in point and nonpoint pollutant loadings from all jurisdictions within the Chesapeake Bay watershed so that water quality standards can be achieved. As part of the EPA TMDL, each jurisdiction is required to develop a Watershed Implementation Plan (WIP) that details how load allocations will be achieved and maintained now and in the future. Additionally, jurisdictions will have to exhibit accountability by achieving 2-year milestone goals.

If jurisdictions fail to develop their WIP or meet their 2-year milestone goals, EPA has identified a set of potential consequences to impose. These consequences range from EPA taking over responsibility for developing the plans to increasing their regulatory oversight and extending their regulatory authority to additional sources of pollution. EPA may deny National Pollutant Discharge Elimination System (NPDES) permits or require additional reductions from regulated sources, increase and target federal enforcement and compliance, and expand NPDES coverage to currently unregulated sources. Examples of currently unregulated sources in many locations include Concentrated Animal Feeding Operations (CAFOs) in the agriculture community and Municipal Separate Stormwater Systems (MS4s) in the developed community. Additionally, EPA may condition or redirect grant funds needed by the State to implement voluntary cost-share programs.

Considering the potential consequences, jurisdictions must not only identify the actions that are immediately available for them to implement, but also identify contingencies. These contingencies are additional actions that they may resort to if the original actions are not successfully implemented, or do not result in the anticipated nutrient and sediment reductions. With additional regulatory controls looming, stakeholders have been encouraged to participate in the process as soon as possible in order to quickly reach consensus on proposed actions.

To follow this aggressive schedule and achieve these requirements, the Delaware Department of Natural Resources and Environmental Control (DNREC) convened the Chesapeake Bay Interagency Workgroup made up of representatives from each DNREC Division, Department of Agriculture, Department of Transportation, Office of State Planning Coordination, County Conservation Districts, US Department of Agriculture, and other stakeholders. Nine subcommittees were formed to address the issues present in the WIP, and they are: Agriculture; Stormwater; Wastewater; Land Use and Comprehensive Plans; Restoration; Public Lands; Funding; Information Technology; and Communications. Subcommittees have been tasked with recommending and reviewing sub-allocating methodologies to the various point and nonpoint sources within the basins, assessing current data tracking and reporting systems, determining maximum implementation goals and methods to fill program and funding gaps, and assisting with writing and providing information for the Watershed Implementation Plan. These subcommittees are also

communicating proposed actions to the respective stakeholder groups, and soliciting their input on WIP elements.

As the largest estuary in the United States, the Chesapeake Bay is essential for the wellbeing of many living things. Not only is it an irreplaceable home for various bay-dwelling organisms, it is also an important resource for thousands of people. The habitats and economical situations of many have been negatively impacted by pollutants entering the rivers and Bay. In particular, nutrient pollution has been a concern in Delaware's Chesapeake Bay Tributaries as decades of monitoring have identified high levels of nutrients and low levels of dissolved oxygen, resulting in these waterways being included on the State's 303(d) List of Impaired Waters. Prominent signs of such pollution have included algal blooms and decaying algae. The coordinated effort led by EPA to develop a TMDL for the entire Chesapeake Bay Watershed is the most recent attempt to correct these issues. The TMDL in Delaware will be achieved through the actions and programs outlined in this WIP.

1.1 Phase II Update

Delaware's Final Phase I WIP was submitted to EPA on November 29, 2010 and met the nutrient and sediment allocations in the final TMDL, which was established on December 29, 2010. The actions specified in Delaware's Phase I WIP model input decks resulted in statewide loads that were 3%, 12%, and 33% under Delaware's nitrogen, phosphorus, and sediment allocations, respectively. Delaware agreed to apply the spare pounds back to the nonpoint source agriculture allocation and the implementation measures have been refined in this Phase II WIP.

Since the TMDL establishment, EPA refined the Watershed Model, resulting in more accurate estimates of urban and suburban lands and more credit for nutrient management on agricultural lands. These refinements also resulted in new planning targets for the Phase II WIPs, which are discussed in Section 4 of this document.

To create Delaware's Phase II WIP, the Phase I document was reviewed and revised to provide more details regarding how implementation is going to occur at the local level. We have attempted to identify who our partners are, where they work, when actions will occur, and the resources they will need for success. This has also resulted in parsing some implementation goals that were originally at a state scale down to a county level in the nonpoint input deck. In addition to several slight modifications to the 2025 goals identified in Phase I, the Phase II WIP input decks also establish implementation goals for 2017 that will achieve 60% of the necessary nitrogen, phosphorus, and sediment reductions.

An itemized list of major changes between Phase I and Phase II follows:

Section 2 – Introduction

- The water quality charts were updated to reflect 2010 delivered loads as estimated by Phase 5.3.2 of the Chesapeake Bay Watershed Model

Section 3 – Development of Phase I Watershed Implementation Plans

- This section was added to discuss the expectations and necessary elements for Phase II WIPs.

Section 4 – Interim and Final Nutrient and Sediment Load Targets

- A table listing Delaware's Phase II Planning Targets was added.

- Tables listing the aggregated wasteload allocations for regulated stormwater were updated to reflect those contained within the 12/29/10 TMDL (Section 4.2.2).
- Tables listing the aggregated wasteload allocations for regulated agriculture were updated to reflect those contained within the 12/29/10 TMDL (Section 4.2.3).
- Tables listing the load allocations were updated to reflect those contained within the 12/29/10 TMDL (Section 4.3).
- Interim load reduction goal tables were updated to reflect Phase II planning targets and include 2013 Milestone goals.

Section 5 – Wastewater

- Indicated that BASF has ceased discharge to the Chesapeake and the NPDES Permit has been voided. This resulted in reductions in TN loads of 2234 lb/year and TSS loads of 4891 lb/year. BASF removed from Tables and Text (Section 5.2).
- Indicated that Invista permit will be reissued in Fall 2011 –Winter 2012 to reduce permitted TN loads by 60% (Section 5.4).
- Table revised to indicate Expiration Dates instead of Renewal Dates (Section 5.4).

Section 6 – On-site Wastewater

- Updated details of and the timeframe for regulatory promulgation of the proposed revisions to the Regulations Governing the Design, Installation, and Operation of On-Site Wastewater Treatment and Disposal Systems (Section 6.4).

Section 7 – Urban/Suburban Stormwater

- Performed QA/QC on stormwater BMP data included in Mudtracker.
- Updated number of Erosion & Sediment Control sites from the NOI database.
- Updated the status of Phase I MS4 permit status for NCC/DeIDOT, and how it affects the forward progress of Phase II permits in Delaware (Section 7.1.2.2.3).
- Updated that the database has been completed and is in use (Section 7.1.2.1.4).
- Updated the timeframe of the proposed revisions to the Delaware Sediment and Stormwater Regulations.

Section 8 – Landuse

- Added a more detailed discussion of each local government within the watershed and their role in achieving the TMDL.
- Created an outline of the phased approach to nutrient offsets and trading and integration with revised sediment and stormwater regulations.
- Completed an analysis of non-farm fertilizer sales data showing a significant decline in phosphorus sold in Delaware since 2005.

Section 9 –Agriculture

- 2010 Accomplishments were added (Section 9.1).
- Descriptions of new programs that have been initiated since the Phase I WIP have been added (Section 9.2).
- Text was updated to reflect changes made to the CAFO regulations in 2011 and the number of operations that have submitted NOIs under the revised CAFO regulations have been updated (Section 9.3.2).
- Implementation goals for 2011, 2013, and 2017 were added for each BMP (Section 9.6).

- A section was added to highlight the concerning difference between the Chesapeake Bay Programs estimates of poultry manure volume and nutrient content and the much lower amounts calculated by the University of Delaware, University of Maryland, and Delaware Department of Agriculture.

Section 10 – Restoration

- Added wetland restoration and forestry project data from 2011 to the restoration tracking database.
- Added language about finalizing the restoration database.
- Added information about on-going restoration efforts in the Nanticoke watershed.
- Included training activities that have occurred since the release of Phase I of the CBWIP.

Section 11 – Public Lands

- DNREC Division of Fish and Wildlife -- updated to reflect BMPs occurring and milestones for the future.
- DNREC Division of Parks and Recreation -- updated to reflect BMPs occurring and milestones for the future.
- Delaware Forest Service -- updated to reflect BMPs occurring and milestones for the future.
- Federal Lands section updated with information from the Feds to reflect BMPs occurring and milestones for the future.
- Reduction targets for federal lands were added.

Section 12 – Air

- Descriptions of local, regional, and national programs to reduce emissions was added

Section 13 – Water Quality Monitoring

- There were no changes to the water quality monitoring section. All test parameters and methods have stayed the same.

Section 14 – Education, Outreach, and Volunteerism

- Added an outline of the major Phase I WIP presentations to stakeholder groups and the public that were completed in 2010.
- Created a summary of the roles, responsibilities and goals of the WIP Communications Team that was formed in Dec. 2010.
- Created a summary of Delaware WIP II accomplishments.
- Created a list of potential partner and advocacy groups for 2012.
- Developed a Phase II Communications and Marketing Plan.

Section 15 – Funding

- Descriptions of several additional funding programs were added.

Section 16 – Data and Model Issues and Concerns

- This chapter was added to discuss data and model issues and concerns.

1.1.1 Sea Level Rise Considerations

Mean sea level is currently rising at a rate of 1.05 feet/100 years at Lewes Delaware according to tide data collected by NOAA since the 1920's. This sea level rise trend is expected to continue and accelerate as a result of global climate change. The average rate of sea level rise in Delaware (3.35 mm/year) is almost double the global rate (1.7 mm/year) because the State is also subsiding, or sinking, at the same time.

Because Delaware is a coastal state and vulnerable to the effects of sea level rise, DNREC has adopted a policy to proactively consider and plan for the potential effects of coastal inundation using the best available science and developed sea level rise scenario maps that can be used as a tool for planning (interactive map: <http://de.gov/slrmmap>). This policy requires that all DNREC programs consider sea level rise impacts during project planning and implementation by conducting vulnerability assessments and contemplating project alternatives. Three sea level rise scenarios were recommended for this purpose: 0.5 meters, 1.0 meters, and 1.5 meters above mean higher high water by 2100. Preparing for the potential long term effects of sea level rise will also help to minimize the shorter term impacts from storm surges, many of which are also in the range of 0.5-1.5 meters.

DNREC's policy and supporting documentation are available online: <http://www.dnrec.delaware.gov/coastal/Documents/SeaLevelRise/Final%20and%20Signed%20DNREC%20OSLR%20scenarios.pdf>. Delaware is addressing the potential effects of sea level rise statewide through the Delaware Sea Level Rise Advisory Committee, a group charged with assessing Delaware's vulnerability to sea level rise and recommending strategies to help the state adapt to these impacts (<http://www.dnrec.delaware.gov/coastal/Pages/DESLRAdvisoryCommittee.aspx>). The committee will complete their vulnerability assessment in the spring of 2012 and have released some preliminary results (Preparing for Tomorrow's High Tide, November 2011). When applicable, preliminary results of the vulnerability assessment are cited in this document.

Sea level rise may cause the permanent inundation of low lying lands (like wetlands), increased extent of temporary flooding from storms, and saltwater intrusion. These three potential impacts may have significant implications for water quality. Increased water levels may result in more dilution in upstream locations but will likely decrease wetland and riparian areas currently acting as nutrient and sediment sinks and may also result in the release of pollutants currently stored in soils. Streams and ditches may not flow as freely as they do currently, potentially resulting in flooding of agricultural and urban lands. And, this may have implications for both stormwater and wastewater treatment systems – onsite and sewer.

While the WIP identifies actions to be implemented by 2025 to achieve current water quality goals, it is also important to ensure that the investments being made now for these goals are not be lost in the future as a result of sea level rise. It is uncertain how best management practices may function under different hydrologic conditions that may result from sea level rise and climate change and more research is need on the net water quality impacts of sea level rise. As such, a discussion of potential sea level rise impacts has been included in each source sector chapter of the Final Phase II WIP.

SECTION 2. INTRODUCTION

2.1 The Chesapeake Bay Drainage in Delaware

In 2000, the State of Delaware entered into a Memorandum of Understanding with the Chesapeake Bay Program signatory jurisdictions, Maryland, Pennsylvania, Virginia, District of Columbia, EPA, and the Chesapeake Bay Commission, to encourage participation in the restoration of the Bay from jurisdictions in the entire watershed. The State of Delaware also committed to working cooperatively with the other parties to achieve the nutrient and sediment reduction targets that all agree are necessary to achieve the goals of a clean Chesapeake Bay thereby allowing the Chesapeake and its tidal tributaries to be removed from the list of impaired waters. Representatives from DNREC and the Department of Agriculture participate on Chesapeake Bay Program committees and workgroups, which discuss the science, modeling, and policy decisions that impact this TMDL and restoration efforts. Additionally, because of Delaware's commitment to improve water quality in the Chesapeake watershed, DNREC has been the recipient of an EPA-Chesapeake Bay Program headwater implementation grant, and more recently a regulatory and accountability grant (CBRAP), and these funds have assisted the State with data tracking and reporting and increased the implementation of projects and practices that have resulted in the reduction of nutrients and sediment to receiving waters.

2.1.1 Chesapeake Rivers and Watersheds

The Chesapeake Bay Watershed includes land area within Delaware, the District of Columbia, Maryland, New York, Pennsylvania, Virginia, and West Virginia. The portion of the Chesapeake Drainage within Delaware makes up about 1% of the land area within the entire Chesapeake Bay Watershed (Figure 1). The watersheds that make up the Chesapeake Drainage in Delaware encompass a 451,268 acre area of land in all three of Delaware's counties. The Chesapeake makes up approximately 10% of New Castle County, 33% of Kent County, and 50% of Sussex County (Figure 2).

The headwater streams and rivers that originate in Delaware all ultimately drain to the Eastern Shore of the Chesapeake. These streams include, from north to south: Elk Creek, Perch Creek, the C&D Canal, Bohemia Creek, Sassafras River, Chester River, Choptank River, Marshyhope Creek, Nanticoke River, Gum Branch, Gravelly Branch, Deep Creek, Broad Creek, Wicomico River, and Pocomoke River. The modeling undertaken by EPA has grouped these streams into three minor basins, 11 303(d) segments, and 26 land river segments (Table 1; Figures 3 and 4).

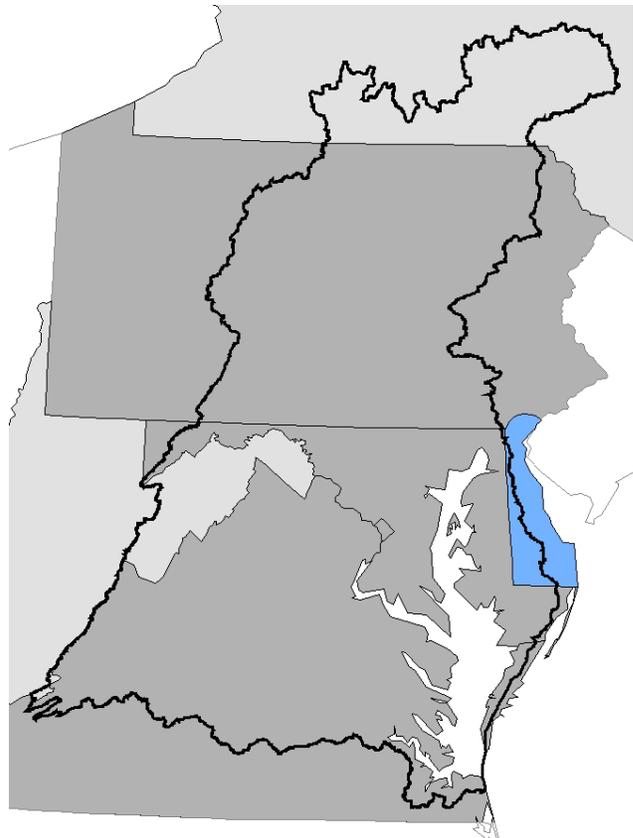


Figure 1: Chesapeake Bay Watershed

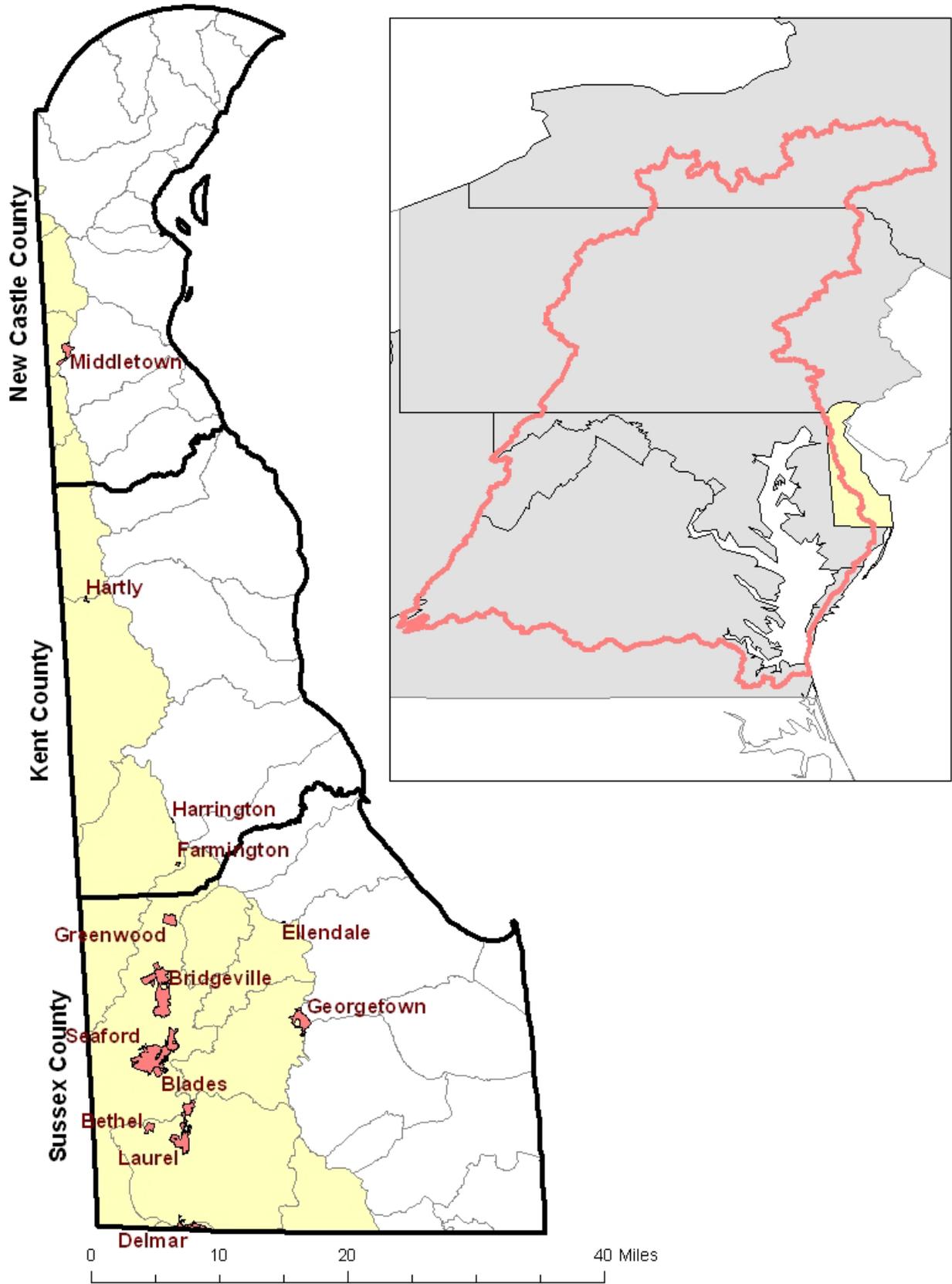


Figure 2: The Chesapeake Drainage within Delaware

Major Basin	Minor Basin	303(d) Segment	Land River Segment	County
Eastern Shore of Chesapeake Bay	Upper Eastern Shore	Elk River (ELKOH)	A10003EU1_2981_0000	NEW CASTLE
			A10003EU1_2983_0000	NEW CASTLE
		C&D Canal (C&DOH_MD)	A10003EU0_3010_0000	NEW CASTLE
		C&D Canal (C&DOH_DE)	A10003EU0_3011_0000	NEW CASTLE
		Bohemia River (BOHOH)	A10003EU0_3201_0000	NEW CASTLE
		Sassafras River (SASOH)	A10003EU0_3361_0000	NEW CASTLE
		Upper Chester River (CHSTF)	A10003EU2_3520_0001	NEW CASTLE
	A10001EU2_3520_0001		KENT	
	Middle Eastern Shore	Upper Choptank River (CHOTF)	A10001EM2_3980_0001	KENT
			A10001EM3_4326_0000	KENT
	Lower Eastern Shore	Middle Nanticoke River (NANOH)	A10001EL2_4400_4590	KENT
			A10001EL2_4590_0001	KENT
			A10005EL2_4590_0001	SUSSEX
			A10005EL0_4591_0000	SUSSEX
			A10005EL0_4594_0000	SUSSEX
			A10005EL0_4597_0000	SUSSEX
		Upper Nanticoke River (NANTF_DE)	A10001EL0_4560_4562	KENT
			A10005EL0_4560_4562	SUSSEX
			A10005EL0_4561_4562	SUSSEX
			A10005EL0_4562_0001	SUSSEX
			A10005EL0_4631_0000	SUSSEX
			A10005EL0_4632_0000	SUSSEX
			A10005EL0_4633_0000	SUSSEX
A10005EL2_4630_0000			SUSSEX	
Pocomoke River (POCTF)		A10005EL2_5110_5270	SUSSEX	
Wicomico River (WICMH)	A10005EL0_5400_0001	SUSSEX		

Table 1: Delaware Drainage Basins and Land River Segments

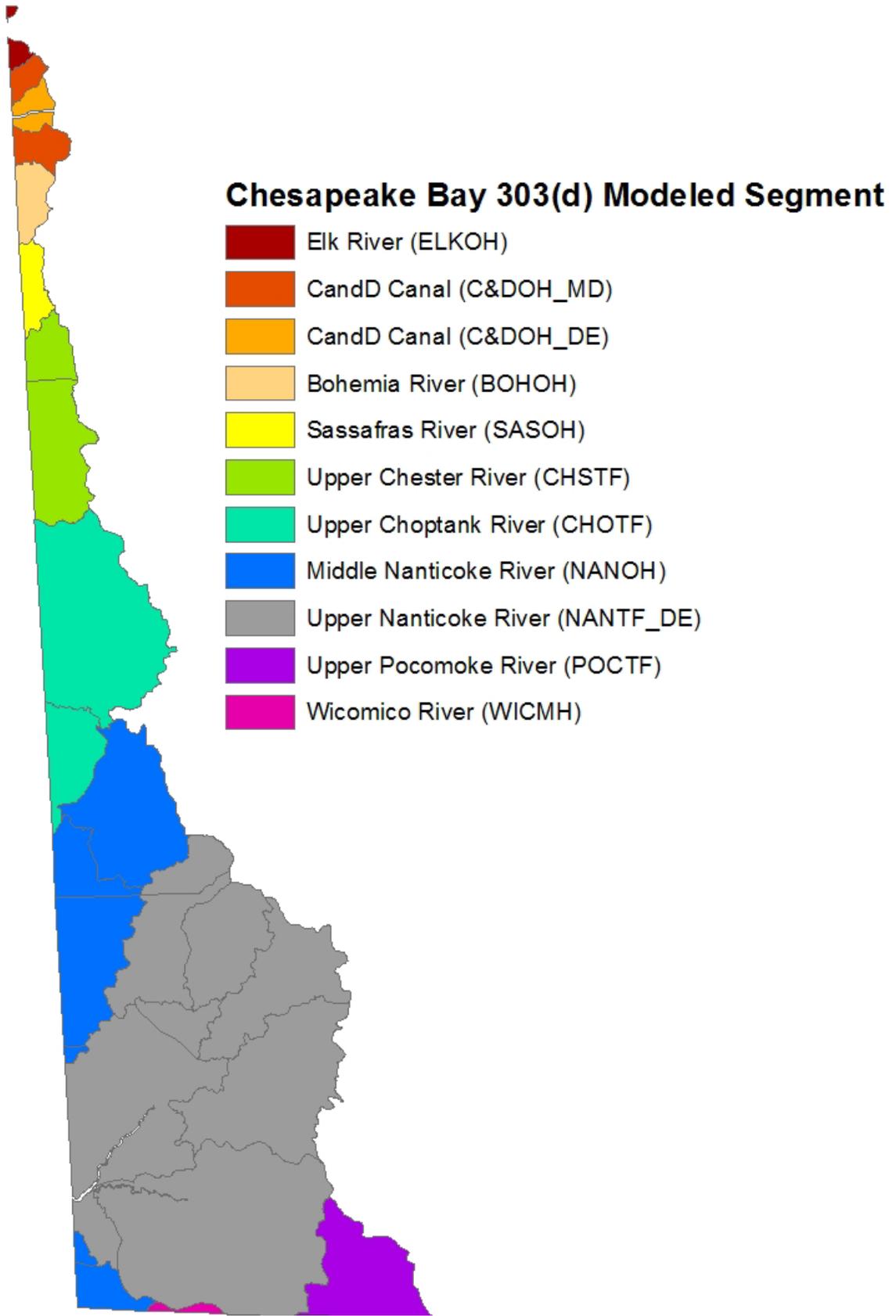


Figure 3: Chesapeake Bay Model 303(d) Segments

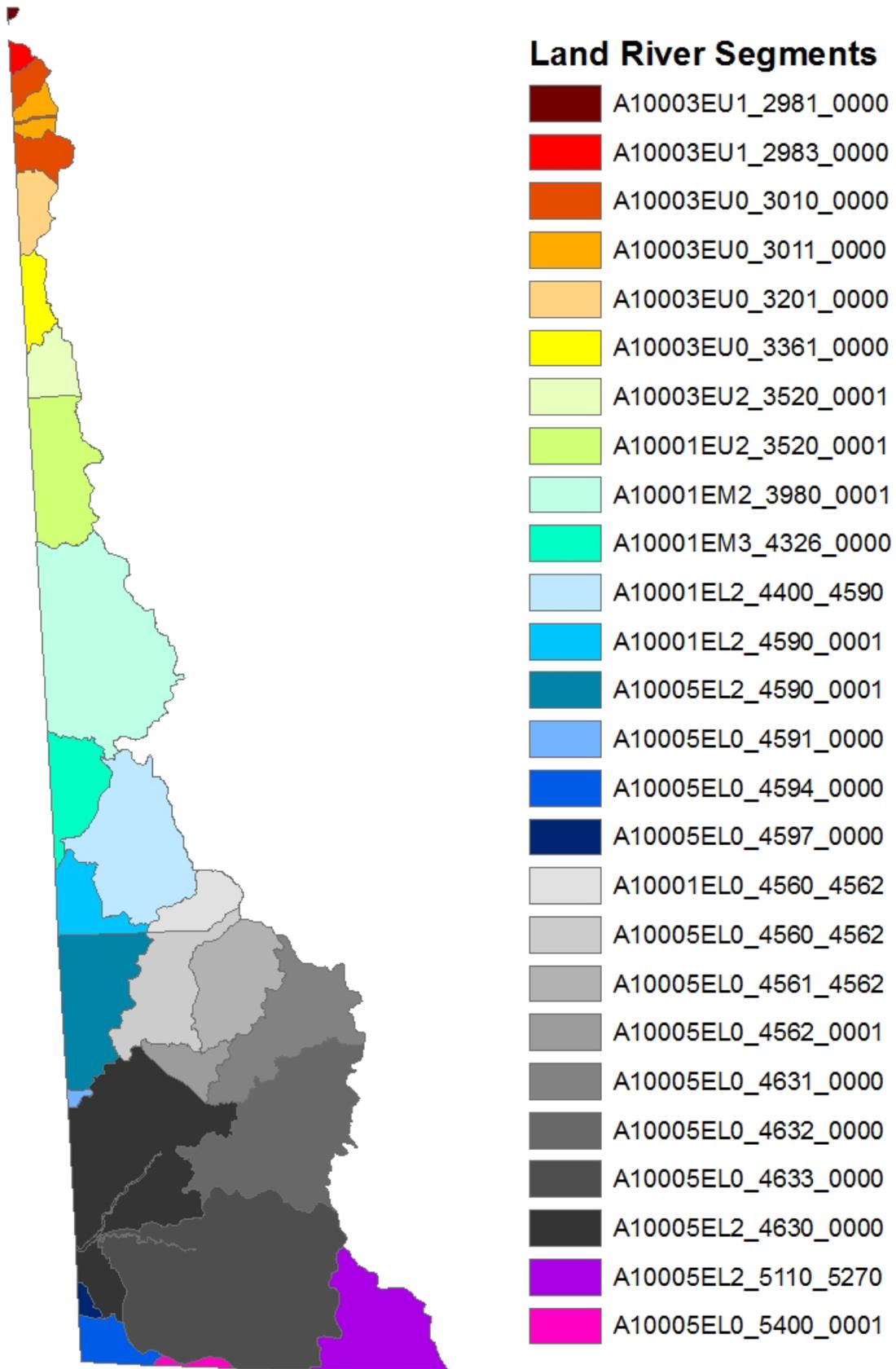


Figure 4: Chesapeake Bay Model Land River Segments

2.1.2 Topography and Soils

2.1.2.1 Soil Pedology/Geologic Development

The Chesapeake Bay drainage is located entirely within the Coastal Plain physiographic province; soils found in this province typically reflect their geologic origin. Coastal plain soils are primarily derived from parent materials containing fluviomarine sediments (e.g., medium to coarse sands containing pebbles, gravel, and other marine and alluvial sediments), with some soils overlain by loamy or windblown (eolian) silty sediments. Elevational differences between the northernmost and the southernmost portions of the drainage further contribute to the observed soil differences. For example, progressively older rock outcroppings are often encountered moving north as slopes become steeper and are subject to greater erosional forces that leave older rock formations exposed. Conversely, younger, sandier soils are often encountered moving south, as the topography slopes more gently. Older exposed rock formations are commonly used as the basis for mapping certain specific soil types in the northern portion of the drainage, while younger sandier sediments are commonly used as the basis for mapping specific soil types in the southern portion.

2.1.2.2 Soil Drainage Classes/ Hydric Soils

Soils in the Chesapeake Bay drainage – like soils everywhere - are generally classified into natural drainage classes on basis of their frequency, depth, and duration of soil saturation or wet periods. That is, soil drainage classes reflect a soils natural depth of wetness due to a seasonal high water table. Soil drainage classes are typically identified/assessed through visual observation of soil redoximorphic features (i.e., white or grey color soil color features that reflect the reduction of iron because of low oxygen concentrations due to saturated soil conditions) to determine and assess a saturated zone. Based on the observed depth to a saturated zone, seven classes of soil drainage are recognized– excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained, and very poorly drained. Soil map units suggestive of wetlands – or, hydric- are typically in the poorly drained or the very poorly drained soil drainage classes. The remaining soil drainage classes are generally considered non hydric or upland. The identification of hydric soils is important because they are one of three key parameters (i.e., including hydrology and hydrophytic vegetation) used to delineate jurisdictional wetlands regulated by the Army Corps of Engineers. Wetland associated hydric soils are functionally important for maintaining or improving water quality by removing pollutants through sedimentation processes and denitrification. Therefore, protection of wetlands and hydric soils is essential for maintaining water quality in the Chesapeake Bay drainage. In the Chesapeake Bay drainage, hydric soil mapping units comprise approximately 40% of the total soil acreage. The Chesapeake herein is further divided into the following five sub basins: Chester-Sassafras, Choptank, Nanticoke, Pocomoke and the Wicomico.

Chester-Sassafras sub basin – (Includes Elk Creek, C &D Canal West, Bohemia Creek, Sassafras and Chester River watersheds) - The Chester- Sassafras sub basin comprises about 9% of the total land area in the Chesapeake drainage. Approximately 64% of the sub basin is in New Castle county and the remaining 36% in Kent county. Hydric soil mapping units comprise approximately 39% of the sub basin's acreage. The Chester-Sassafras sub basin is further subdivided into subordinate sub basins as defined by the boundaries' of New Castle and Kent County.

New Castle County portion of the Chester-Sassafras sub basin – The northern portion of the Chester-Sassafras sub basin is located in New Castle County. Approximately 31% of the sub basin's total acreage is comprised of hydric soil map units. The primary hydric soil map units mapped here are Fallsington, Hammonton-Fallsington-Mullica complex, and Othello; collectively these map units comprise approximately 65% of the total hydric soil acreage. These soils have seasonal high water tables at or near the soil surface, and have moderate to slow water permeabilities with moderate to high runoff potentials. Topographically these map units typically occupy the lowest landscape positions, and contain landscape features such as depressions, swales, un-dissected flats, or drainage ways.

The most prominent non-hydric soil map units in the sub basin are Reybold, Woodstown, and Ingleside-Hammonton-Fallsington complex; collectively these soil map units comprise approximately 37% of the total acreage of non-hydric soils. These soils usually have seasonal high water tables above 20 inches, and have moderate water permeability rates with slight runoff potentials. Topographically these map units occupy well-dissected upland flats or terraces.

Kent County portion of the Chester-Sassafras sub basin – The southern portion of the Chester-Sassafras sub basin is located in Kent County. Approximately 53% of the sub basin's total soil acreage is comprised of hydric soil map units. Some of the major hydric soil map units mapped in this sub basin is Fallsington, Hurlock, and Longmarsh- Indiantown; collectively these map units comprise approximately 60% of the total acreage of hydric soils. These soils have seasonal high water tables at or near the soil surface, and have moderate to slow water permeabilities with moderate to high runoff potentials. Topographically these map units occupy the lowest landscape positions, often containing landscape features such as depressions, swales, un-dissected flats, or drainage ways.

The major non- hydric or upland soil mapping units mapped here are Hammonton, Ingleside, and Unicorn; collectively these map units comprise approximately 56% of the total acreage of non-hydric soils. These soils usually have a seasonal high water table above 20 inches, and have moderate to rapid soil permeabilities with slight runoff potentials. Topographically, these map units are found on well-dissected upland flats or terraces.

Choptank sub basin – The Choptank sub basin comprises about 25% of the greater Chesapeake drainage, and is entirely in Kent County. Approximately 34% of the sub basin's total soil acreage is comprised of hydric soil map units. The major hydric soil map units in the Choptank sub basin are Fallsington, Kentuck, and Longmarsh-Indiantown; collectively these map units comprise about 65% of the sub basins' total acreage of hydric soils. The soils in these map units have seasonal high water tables at or near the soil surface, and have moderate to slow water permeabilities with moderate to high runoff potentials. Topographically these map units occur in lower landscape positions, often containing landform features such as depressions, swales, un-dissected flats, or drainage ways.

The major non-hydric or upland soil map units mapped in the sub basin are Hambrook, Hammonton, and Woodstown; collectively these map units comprise about 38% of the total non-hydric soil acreage in the sub basin. The soils in these map units are typically moderately well to well drained and exhibit seasonal high water tables at soil depths usually greater than 20 inches. These soils also have moderate permeabilities with slight runoff potential. Topographically, these map units are found on well-dissected upland flats or terraces.

Nanticoke sub basin – The Nanticoke is the largest sub basin and comprises approximately 65% of the land area in the greater Chesapeake drainage. Most of the sub basin is in Sussex County. Approximately 43% of sub basin's total soil acreage is comprised of hydric soil map units. The most prominent hydric soil map units mapped in the Nanticoke sub basin are Fallsington, Hurlock, and Corsica; collectively these map units comprise about 62% of the total hydric soil acreage in the sub basin. These soils have seasonal high water tables at or near the soil surface, and have moderate to slow water permeabilities with moderate to high runoff potentials. Topographically, these soil map units typically occur in the lower landscape positions, often containing landscape features such as swales, un-dissected flats, or drainageways.

The primary non-hydric soil or upland soil map units in the sub basin are Pepperbox-Rosedale, Hammonton, and Evesboro; collectively these map units comprise approximately 40% of the total acreage of non-hydric soils in the sub basin. Moreover, these soils map units typically exhibit seasonal high water tables at soil depths greater than 20 inches from the soil surface, and have moderate to rapid water permeability with low to moderate runoff potentials. Topographically, these map units are found on higher landscape positions containing well-dissected upland flats or terraces.

Pocomoke sub basin – The Pocomoke sub basin comprises less than 1% (~0.8%) of the land area in the greater Chesapeake drainage. Approximately 50% of the total soil acreage in the sub basin is comprised of hydric soil map units. The major hydric soil map units mapped in the Pocomoke sub basin are Hurlock, Askecky, and Mullica; collectively these map units comprise about 72% of the total hydric soil acreage. These soils typically have seasonal high tables at or near the soils surface, and have moderate to slow permeabilities with moderate to high runoff potentials. Topographically these map units are found in the lowest landscape positions, often containing landscape features that include depressions, swales, un-dissected flats, or drainage ways.

The major non-hydric soil or upland soil map units mapped in the Pocomoke sub basin are Klej, Klej-Galloway, and Rumford; collectively these soil map units comprise approximately 62% of the sub basins' acreage of hydric soils. Seasonal high water table are typically found at depths greater than 20 inches, and have moderate water permeabilities with low to moderate runoff potentials. Topographically, these map units are found on higher landscape positions containing well-dissected upland flats or terraces.

Wicomico sub basin – The Wicomico is the smallest sub basin and comprises less than 1% (~0.12%) of the total land area in the greater Chesapeake drainage. Approximately 48% of the total soil acreage in the Wicomico sub basin is comprised of hydric soil map units. The primary hydric soil map units in the Wicomico sub basin are Lenni, Fallsington, and Corsica; collectively these soil map units comprise approximately 79% of the sub basin's total acreage of hydric soils. These soils are poorly drained and have seasonal high water tables at or near the soil surface, and have moderate to slow water permeabilities with moderate to high runoff potentials. Topographically, these soil map units typically occur in the lower landscape positions, often containing landscape features such as swales, un-dissected flats, or drainageways.

The primary upland or non-hydric soil map units are Pepperbox-Rockawalkin, Keyport, and Woodstown; collectively these map units comprise approximately 50% of the sub basins' total acreage of upland soils. These soils typically have seasonal high water tables greater than 20 inches from the soil surface, and have moderate water permeabilities with low to moderate runoff potentials. Topographically these map units are found on higher landscape positions containing well-dissected upland flats or terraces.

2.1.3 Land Use

Land use is important to consider when formulating an action plan to address nonpoint source pollution in the Chesapeake Bay Watershed. As water runs over the landscape, it picks up pollutants that are discharged into streams through runoff. Additionally, water runs through the soils, carrying pollutants with it into the groundwater. The polluted groundwater then seeps into the surface water, providing another conduit for nonpoint source pollution (Fetter, 1994). Thus, activities that occur on land impact the quality of both our ground and surface waters.

The Chesapeake Drainage within Delaware is predominantly rural (Figures 5 and 6). According to the 2007 Land Use and Land Cover (LULC) data, about 50% of the watershed is in agriculture, 40% is in natural lands uses of forests and wetlands, and 10% is developed (DOSPC, 2007). The towns are still relatively small, but growing. Compared to land use data from 1984 (Figure 7), agricultural practices as well as natural land covers like forests and wetlands have decreased. Agricultural uses have decreased by 17,595 acres, or 7%. Natural areas have decreased by 16,166 acres, 9%. During this same time period, there has been a steady increase in developed land uses, which include residential, commercial, and industrial areas. This portion of the landscape has increased by 35,346 acres since 1984, a 272% increase.

Given the large portion of the watershed engaged in agriculture, and the consistent growth in urban/residential acreage, this WIP can only be successful if agriculture is addressed and provisions are included to ensure that development occurs in a manner that is protective of surface and ground water quality.

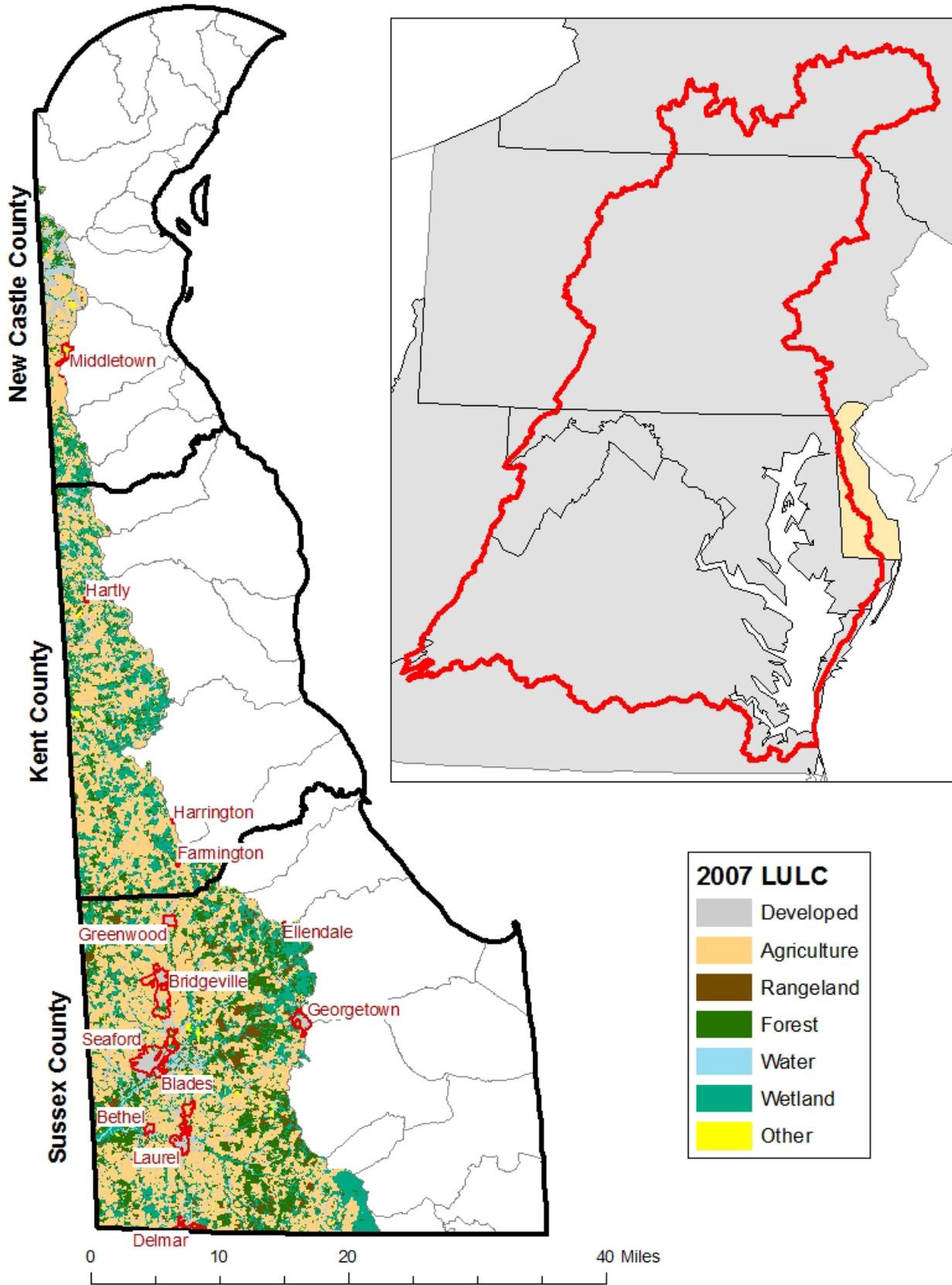


Figure 5: 2007 Land Use and Land Cover Data for the Chesapeake Drainage

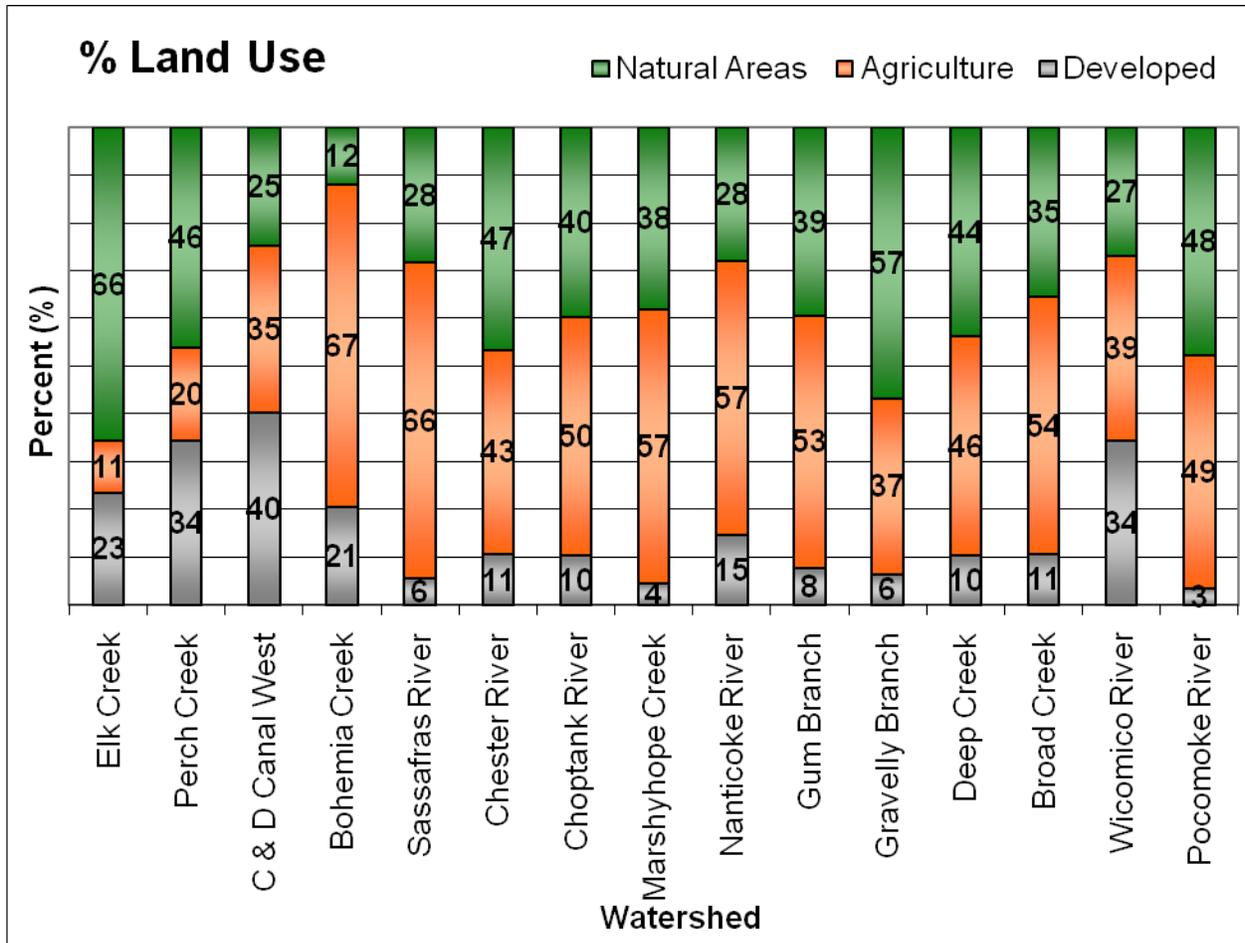


Figure 6: 2007 Land Use Percentages for Chesapeake Watersheds

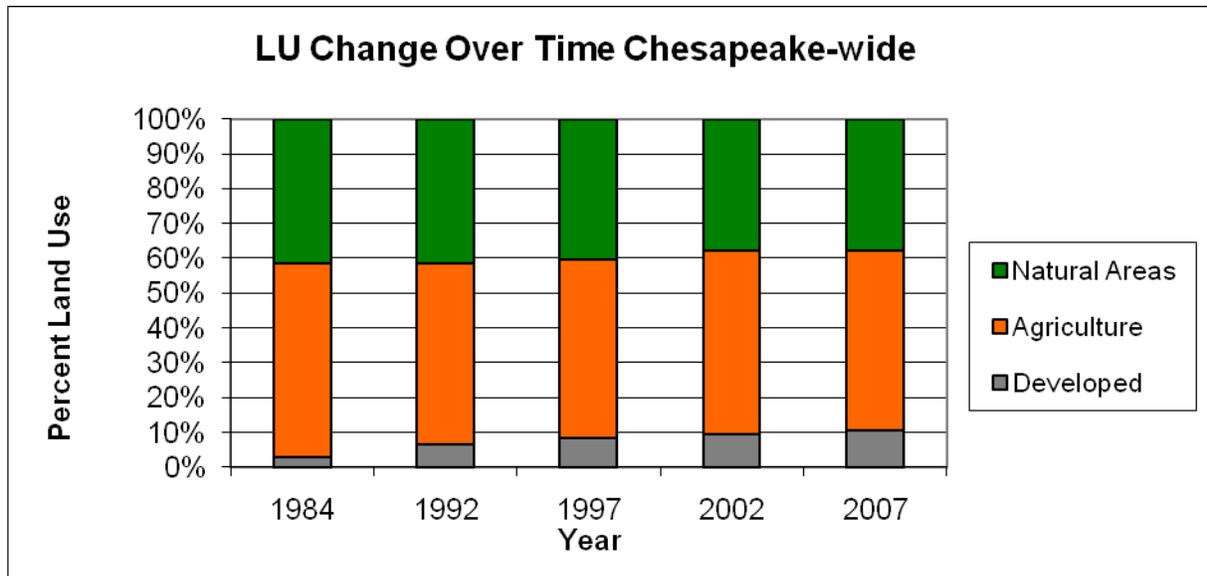


Figure 7: Land Use Changes Over Time in the Chesapeake Drainage

2.2 Water Quality in Delaware's Chesapeake Tributaries

Water quality of the Chesapeake Bay Watershed has been monitored for more than 25 years by federal, state, academic, and citizen monitoring groups. Groundwater quality in the Chesapeake Bay Basin watershed has been highly impacted by agricultural activities in addition to residential and commercial development, including on-site wastewater (septic) discharges (Andres et al., 2007).

The surface waters (rivers, streams, and ponds) have been routinely monitored for many years. Intensive monitoring was conducted prior to TMDL model development, and sampling continues on at least a monthly basis at several locations. Collected data from this monitoring has revealed both nitrogen and phosphorus enrichment in the rivers, streams, and ponds of the Chesapeake (DNREC, 2010). Although nutrients are essential elements for plants and animals, their presence in excessive amounts can cause significant negative impacts to fish and other aquatic life (EPA, 2002).

Symptoms of nutrient enrichment can include excessive macroalgae growth, phytoplankton blooms (some potentially toxic), large daily swings in dissolved oxygen levels, loss of submerged aquatic vegetation (SAV), loss of aquatic habitat, and fish kills (EPA, 2002; Figure 8).

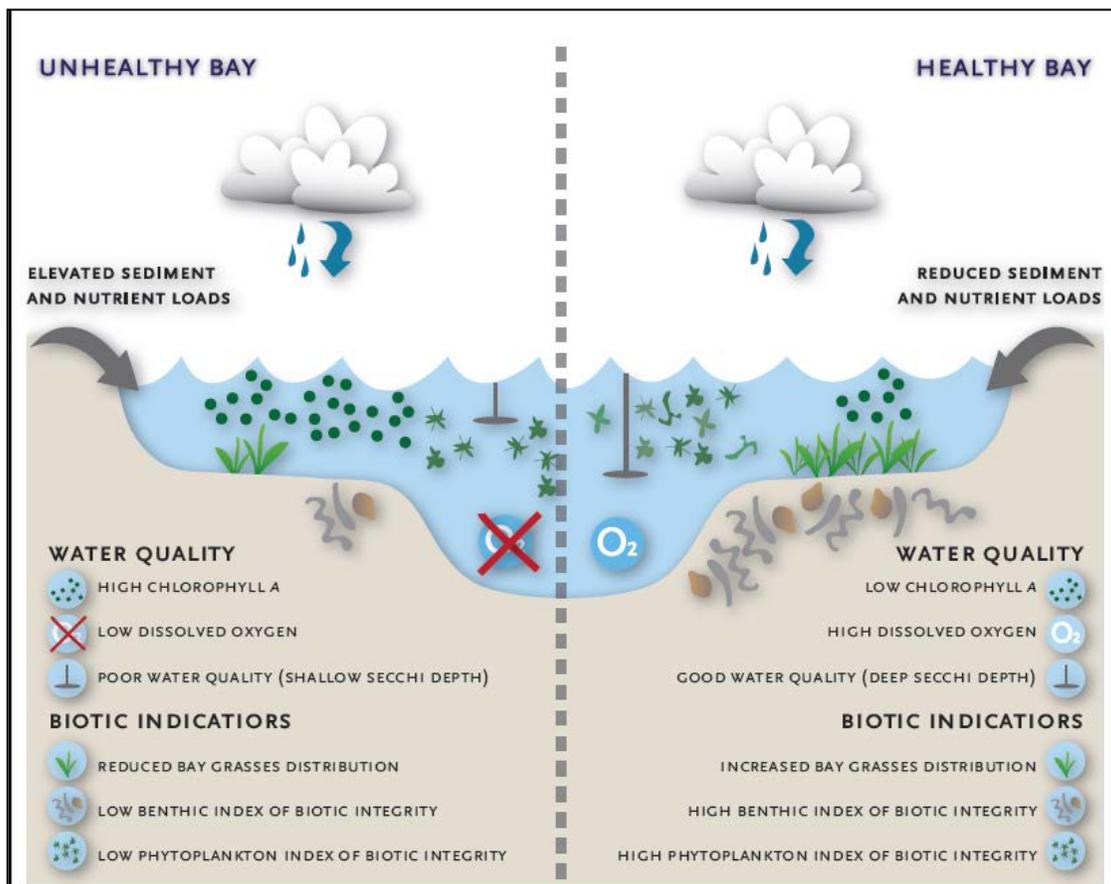


Figure 8: Comparison of good water quality versus poor water quality

These symptoms can be fatal to bay creatures, and pose a dire threat to the future of Delaware's Chesapeake tributaries, as well as the bay itself. Not only is this a threat to the Bay as a significant natural,

ecological, and recreational resource, it is also a threat to the Bay as a significant economical source. Local and State economies depend on the Bay to provide recreation, produce revenue, maintain property values, and improve quality of life. With the huge responsibility of maintaining people, animals, and plants living within the watershed, the Bay must be protected from further harm caused by excessive nutrients.

Furthermore, nutrient over-enrichment and violation of water quality standards have been documented by the State's Watershed Assessment Reports (305(b) Reports) and list of impaired waters (303(d) List) since 1996 (DNREC, 1996; DNREC, 1998a; DNREC, 2002; DNREC, 2004; DNREC, 2006a; DNREC, 2008, DNREC 2010). These reports summarize the designated uses for waters in the State and indicate whether those uses are being achieved. The designated uses for the waters of the Chesapeake are:

- Primary contact recreation,
- Secondary contact recreation,
- Fish, aquatic life, and wildlife (with special protection of open water fish and shellfish, shallow-water bay grass, and migratory fish spawning and nursery areas in the Nanticoke River and Broad Creek),
- Industrial water supply,
- Agricultural water supply (in some locations only in the freshwater segments), and
- Waters of Exceptional Recreational and Ecological Significance (ERES) in several watersheds of the Chesapeake (Figure 9). These waters are recognized as special natural assets of the State, and must be protected and enhanced for the benefit of present and future generations of Delawareans.

EPA has designated uses for tidal water, and they are:

- Migratory spawning and nursery (Feb. 1 – May 31),
- Open water (year-round)
- Shallow water (submerging aquatic vegetation growing season)

The designated uses must meet certain water quality criteria. When these criteria are not met, the waters are required to have Total Maximum Daily Loads (TMDLs) established. The primary pollutants and/or stressors causing violation of water quality standards in the Chesapeake are high concentrations of nutrients, low levels of dissolved oxygen, high levels of bacteria, and high water temperatures.

Pollutant loads to surface waters fall into two categories: point sources and nonpoint sources. A point source is a specific source, such as an effluent pipe. Specifically for Delaware's Chesapeake Basin, point sources include wastewater treatment plants. Nonpoint sources of pollution are more diffuse and harder to track. In Delaware, nonpoint source pollution occurs as a result of using land for agriculture or urban development, and includes runoff from fertilizers and leaching from septic systems. In these cases, nitrogen and phosphorus enter surface waters through groundwater discharges or overland runoff.

In the Chesapeake Bay watersheds, phosphorus is the nutrient most frequently found to limit plant growth in freshwater streams. Phosphorus contributes to eutrophication as it moves into surface waters through erosion, runoff, and subsurface flow in artificial drainage and groundwater discharge. Excessive accumulation of soil phosphorus must be minimized in order to reduce the transport of soluble or sediment bound phosphorus to sensitive water bodies. Compared to the amount found in fertilizers and required by crops, the amount of phosphorus that will impair water quality is very low (Sims and Campagnini, 2002).

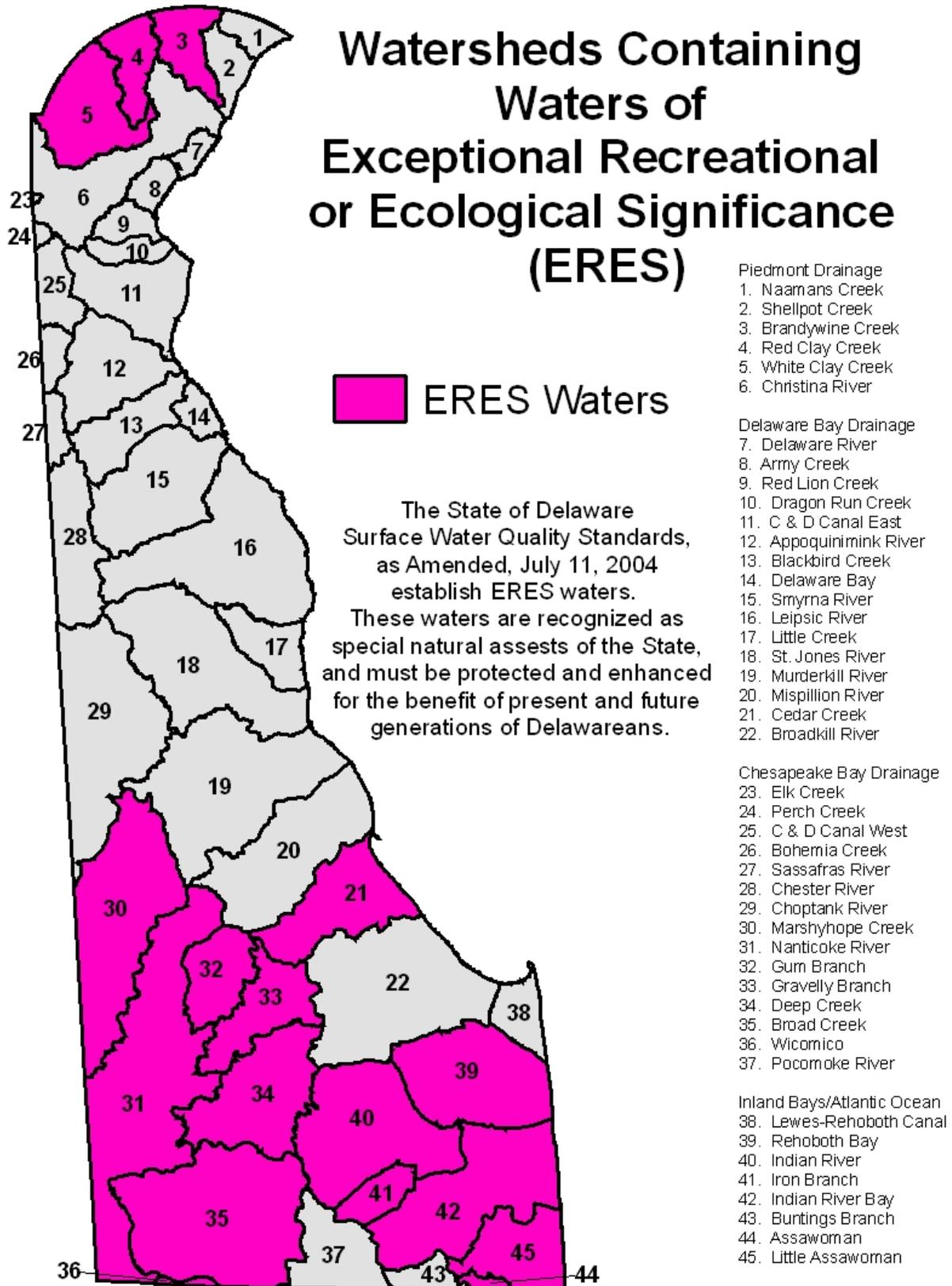


Figure 9: Waters of Exceptional Recreational and Ecological Significance (ERES)

Nitrogen can be transported from soils to ground water by leaching, and from soils to surface water by erosion or runoff. Nitrate leaching is a major concern in humid regions with excessively well-drained soils that overlay shallow water tables, conditions common throughout Delaware. Nitrate-contaminated water can be highly dangerous to people, plants, and animals. Drinking water with high nitrate levels has been associated with several health problems, the most serious being methemoglobinemia (deficiency of oxygen in blood) in infants. Additionally, ground water with high nitrate levels that discharge into sensitive surface waters can contribute to the long-term eutrophication of these water bodies. Erosion and surface runoff can transport soluble inorganic and organic nitrogen to surface water. Most of the nitrogen lost in this manner is sediment bound organic nitrogen. Although the solubility of nitrate favors its loss in runoff instead of sediment transport, total nitrogen losses are usually several times greater than soluble nitrogen (Sims and Campagnini, 2002).

According to EPA's Phase 5.3.2 model results, the 2010 delivered nitrogen, phosphorus, and sediment loads from Delaware make up 1.7%, 1.8%, and 1.1% of the total loads to the Chesapeake, respectively. Within the State, the nutrients and sediment primarily come from agricultural sources, which make up the largest portion of the landscape (Figures 10, 11, and 12).

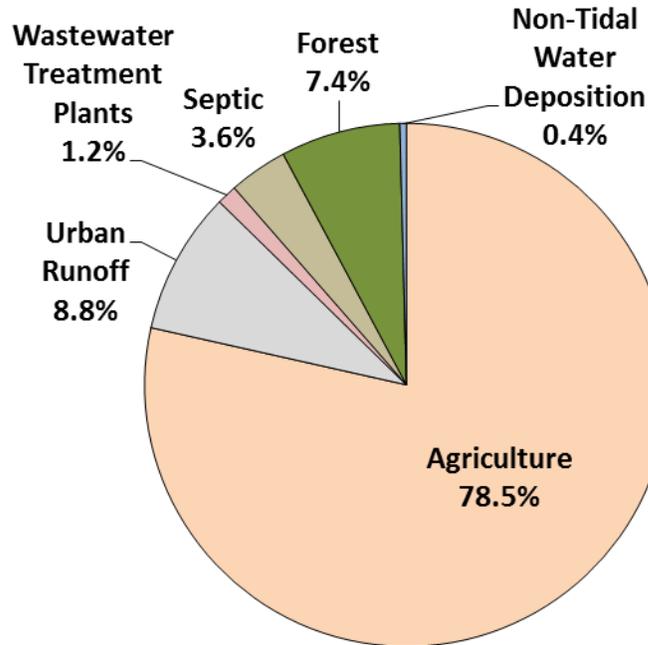


Figure 10: 2010 sources of nitrogen in Delaware's Chesapeake calculated by EPA's Phase 5.3.2 model

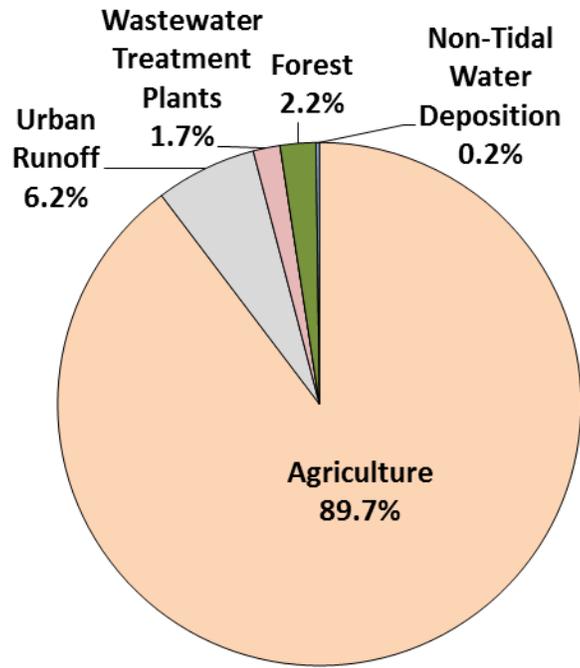


Figure 11: 2010 sources of phosphorus in Delaware's Chesapeake calculated by EPA's Phase 5.3.2 model

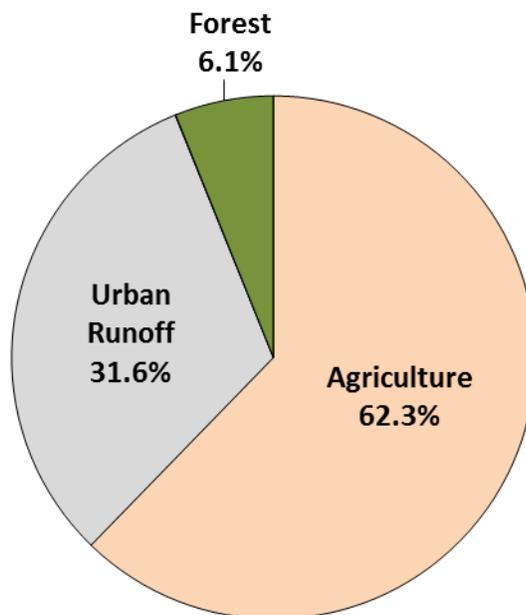


Figure 12: 2010 sources of sediment in Delaware's Chesapeake calculated by EPA's Phase 5.3.2 model

Delaware's Total Maximum Daily Loads, Chesapeake Tributary Action Teams, and 2.3 the Pollution Control Strategy Development Process

A TMDL sets a limit on the amount of pollution that can be discharged into a waterbody such that water quality standards can still be met. A non-scientific definition for TMDL could be "pollution limit." TMDLs consist of three parts: a wasteload allocation (WLA) for point sources and other regulated sources, a load allocation (LA) for nonpoint sources, and a margin of safety (MOS).

$$\text{TMDL} = \text{WLA} + \text{LA} + \text{MOS}$$

2.3.1 Delaware's TMDLs

TMDLs were developed by DNREC in response to data collected from water quality monitoring. The data indicated that numerous streams within the Chesapeake were impaired; they do not meet Delaware's Water Quality Standards for dissolved oxygen, or meet target concentrations for nitrogen or phosphorus. These TMDLs include a waste load allocation (WLA) for point sources, a load allocation (LA) for nonpoint sources, and an implicit margin of safety.

DNREC TMDLs were established for nitrogen and phosphorus in the Nanticoke River watershed (including Gum Branch, Gravelly Branch, Deep Creek, and Broad Creek) in 1998 (DNREC, 1998b). This TMDL WLA requires the municipal wastewater treatment plants in the watershed (Bridgeville, Laurel, and Seaford) to employ biological nutrient reduction (BNR) or an equivalent process to reduce their total nitrogen (TN) and total phosphorus (TP) loads. To achieve this, facilities were upgraded and in 2011 all were operating at or below their TMDL permitted limits. The Invista industrial facility also had to reduce its nitrogen load as a result of this TMDL. The remaining point sources were capped at their baseline loads, and since the TMDL establishment, one has been eliminated and two have significantly decreased their discharges. The LA portion of this TMDL also requires a 30% reduction in the nonpoint source nitrogen load and a 50% reduction in the nonpoint source phosphorous load, both from the 1992 baseline levels.

DNREC TMDLs were also established for nitrogen and phosphorus in the Chester River, Choptank River, Marshyhope Creek (DNREC, 2006b), and Pocomoke River in 2006 (DNREC, 2006c). There are no point sources of pollution in these watersheds. These TMDLs called for nonpoint reductions ranging from zero to 55% for nitrogen and 25% to 55% for phosphorus (See Figures 13 and 14).

DNREC also established bacteria TMDLs in the Chesapeake watersheds in 2006 (DNREC, 2006d).

DNREC's TMDLs are designed to address local impacts by achieving Delaware's water quality standards and Maryland's standards at the state line, whereas the EPA TMDL that is being developed tracks nutrients from where they enter the system to assess their downstream impact on the main stem of the bay. Additionally, DNREC does not have water quality goals or TMDLs for sediment, so the EPA limits will be the first within the state. The TMDL that calls for the most stringent reductions will supersede the other.

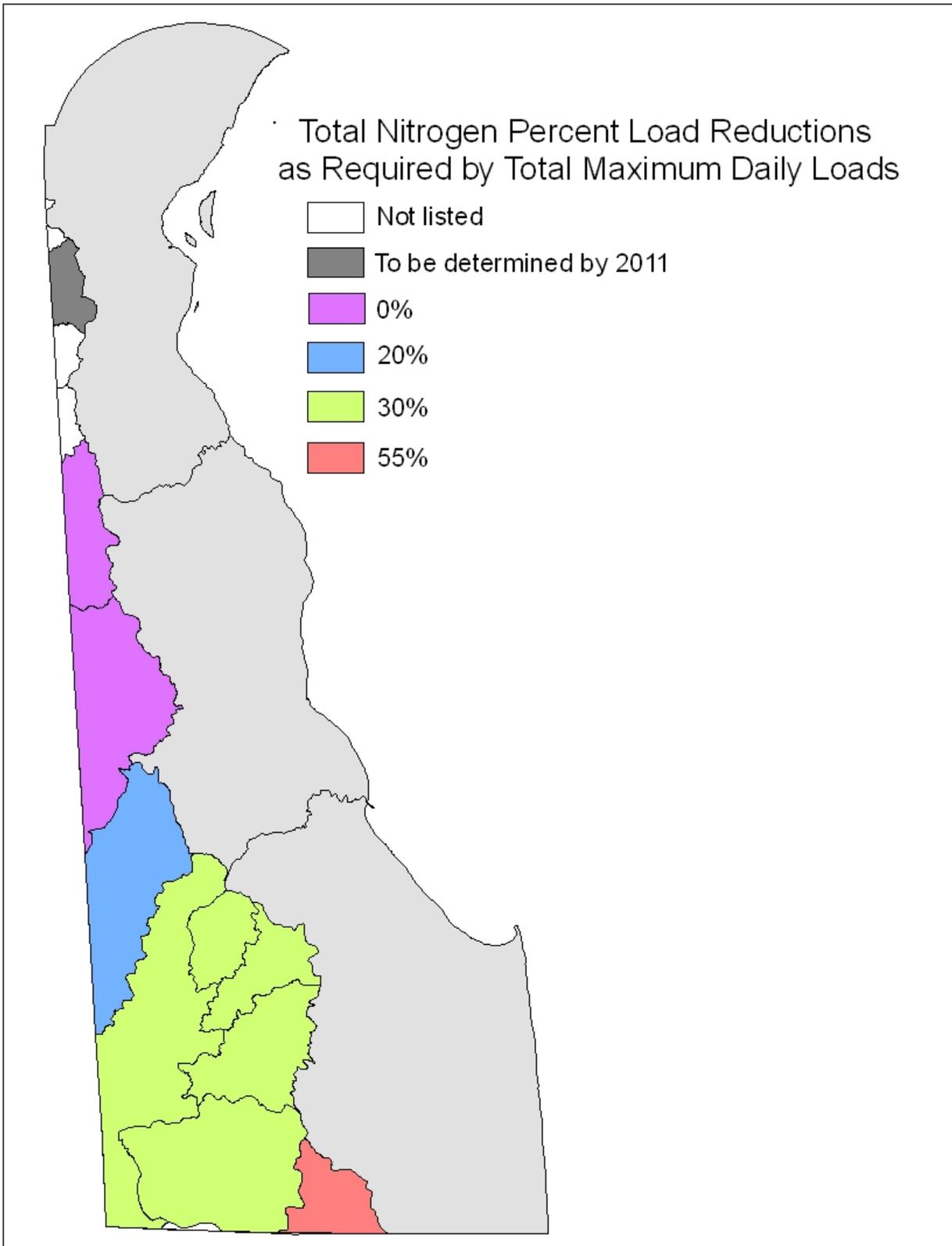


Figure 13: Nonpoint source nitrogen reductions required by DNREC TMDLs

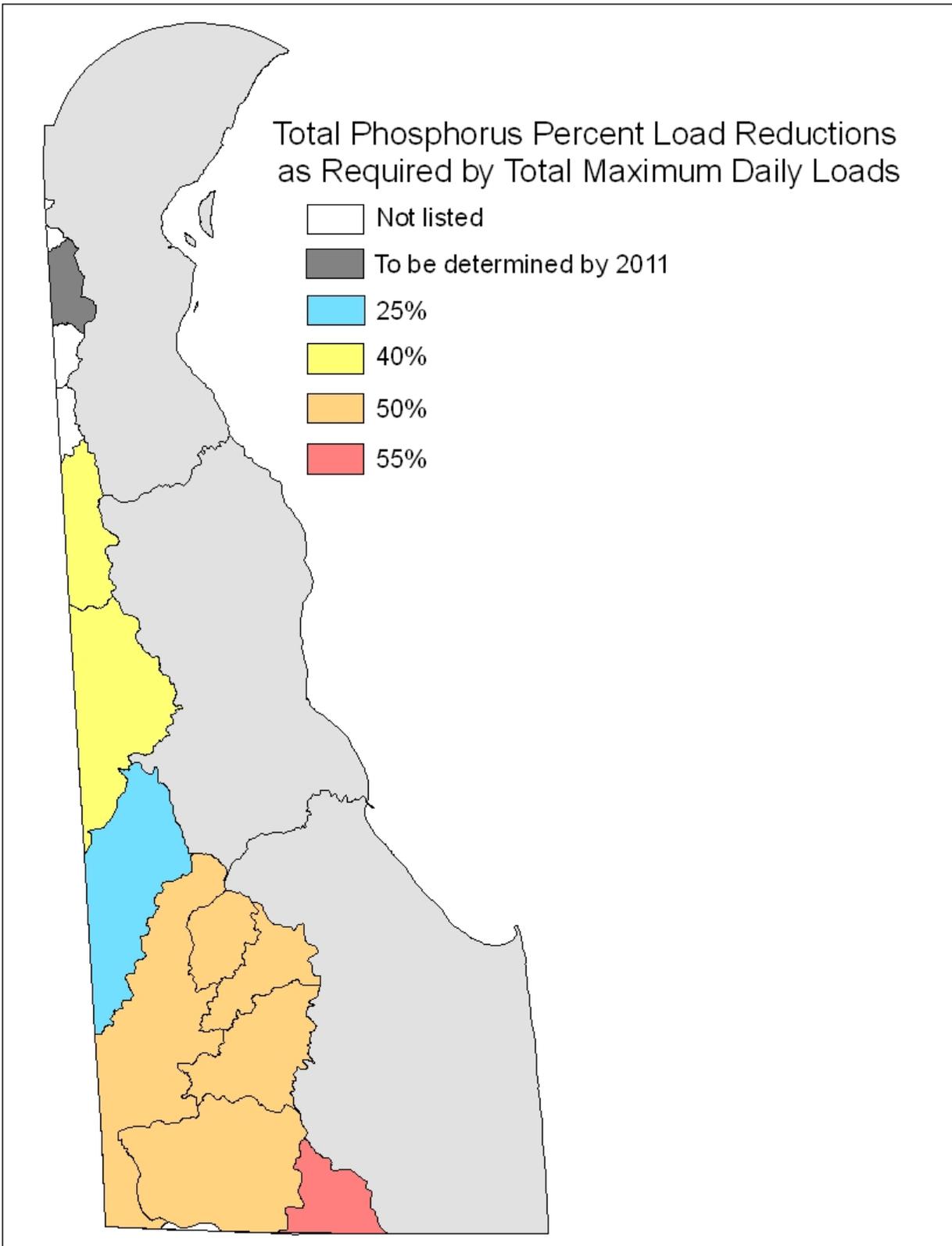


Figure 14: Nonpoint source phosphorus reductions required by DNREC TMDLs

2.3.2 Tributary Action Teams and Pollution Control Strategies

All DNREC TMDL regulations stipulate that nutrient reductions will be achieved through the development of a Pollution Control Strategy (PCS) developed by DNREC in concert with the affected public.

A PCS, similar to a Tributary Strategy, is a set of actions designed to improve water quality, and specifically achieve a TMDL. A PCS may include both voluntary and regulatory actions that can reduce pollution from current and future land practices. In Delaware, local Tributary Action Teams (TATs) are diverse groups of stakeholders with various interests, concerns, knowledge, and beliefs. They were formed to recommend PCS actions and best management practices (BMPs) appropriate for their own individual watersheds. In the Chesapeake there are two TATs: the Nanticoke TAT, which first began meeting in 1998, and the Upper Chesapeake TAT, which covers the Chester and Choptank watersheds and began meeting in 2007 (Figure 15). The Nanticoke TAT consists of farmers, developers, town managers, conservationists, and residents with homes along the tributaries of the Nanticoke River and tidal Broad Creek. The Upper Chesapeake TAT consists of tax ditch managers, local business owners, farmers, and community residents, including members of the local Amish community.

The process used by Delaware's TATs was based on "Public Take – Real Choices, Real Strategies," which was primarily designed by representatives from DNREC and the University of Delaware's Cooperative Extension Service and Marine Advisory Service, the Center for the Inland Bays (Appendix A). Using this form of public process, the public is brought together and given the opportunity to address the process in the beginning rather than at the end. The process includes six steps: organization of work teams; education; issue framing; evaluation of the issue framework; public forums/choice work; and recommendations. Once teams were formed, they identified common threads and core values to guide their work. During the education portion of the process, teams listened to presentations on multiple topics such as wastewater treatment plants, septic systems, stormwater, golf courses, and agriculture. Teams then worked through ranking priorities, gathering wider public input, and drafting recommendations for DNREC's consideration.

In Delaware's previous water quality improvement efforts, after the TMDL was developed, the implementation mechanism, the Pollution Control Strategy, was formulated. The current EPA TMDL approach requires the implementation mechanism – the Watershed Implementation Plan – to be identified during the TMDL development process. The PCS work that was started with Delaware's TATs in the Chesapeake has been reviewed, updated, and enhanced to better assist Delaware's WIP.

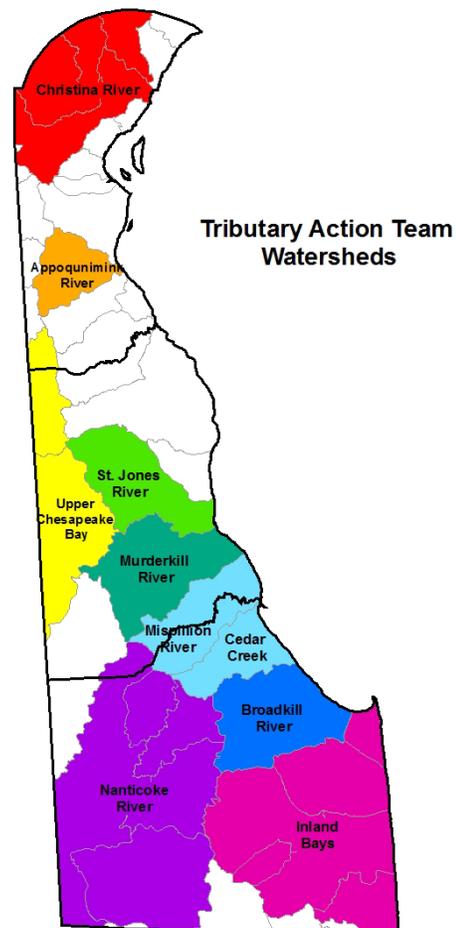


Figure 15: Tributary Action Teams in Delaware

2.4 EPA's Total Maximum Daily Loads

Below is an excerpt from EPA's documentation regarding their 2010 TMDL for the Chesapeake Bay:

"The U.S. Environmental Protection Agency (EPA) has established the Chesapeake Bay Total Maximum Daily Load (TMDL), a historic and comprehensive "pollution diet" with rigorous accountability measures to initiate sweeping actions to restore clean water in the Chesapeake Bay and the region's streams, creeks and rivers.

Despite extensive restoration efforts during the past 25 years, the TMDL was prompted by insufficient progress and continued poor water quality in the Chesapeake Bay and its tidal tributaries. The TMDL is required under the federal Clean Water Act and responds to consent decrees in Virginia and the District of Columbia from the late 1990s. It is also a keystone commitment of a federal strategy to meet President Barack Obama's Executive Order to restore and protect the Bay.

The TMDL – the largest ever developed by EPA – identifies the necessary pollution reductions of nitrogen, phosphorus and sediment across Delaware, Maryland, New York, Pennsylvania, Virginia, West Virginia and the District of Columbia and sets pollution limits necessary to meet applicable water quality standards in the Bay and its tidal rivers and embayments. Specifically, the TMDL sets Bay watershed limits of 185.9 million pounds of nitrogen, 12.5 million pounds of phosphorus and 6.45 billion pounds of sediment per year – a 25 percent reduction in nitrogen, 24 percent reduction in phosphorus and 20 percent reduction in sediment. These pollution limits are further divided by jurisdiction and major river basin based on state-of-the-art modeling tools, extensive monitoring data, peer-reviewed science and close interaction with jurisdiction partners.

The TMDL is designed to ensure that all pollution control measures needed to fully restore the Bay and its tidal rivers are in place by 2025, with at least 60 percent of the actions completed by 2017. The TMDL is supported by rigorous accountability measures to ensure cleanup commitments are met, including short- and long-term benchmarks, a tracking and accountability system for jurisdiction activities, and federal contingency actions that can be employed if necessary to spur progress.

Watershed Implementation Plans (WIPs), which detail how and when the six Bay states and the District of Columbia will meet pollution allocations, played a central role in shaping the TMDL. Most of the draft WIPs submitted by the jurisdictions in September 2010 did not sufficiently identify programs needed to reduce pollution or provide assurance the programs could be implemented. As a result, the draft TMDL issued September 24, 2010 contained moderate- to high-level backstop measures to tighten controls on federally permitted point sources of pollution.

A 45-day public comment period on the draft TMDL was held from September 24 to November 8, 2010. During that time, EPA held 18 public meetings in all seven Bay watershed jurisdictions, which were attended by about 2,500 citizens. EPA received more than 14,000 public comments and, where appropriate, incorporated responses to those comments in developing the final TMDL.

After states submitted the draft WIPs, EPA worked closely with each jurisdiction to revise and strengthen its plan. Because of this cooperative work and state leadership, the final WIPs were significantly improved. Examples of specific improvements include:

Regulated point sources and non-regulated nonpoint sources of nitrogen, phosphorus, and sediment are fully considered and evaluated separately in terms of their relative contributions to water quality impairment of the Chesapeake Bay's tidal waters.

Committing to more stringent nitrogen and phosphorus limits at wastewater treatment plants, including on the James River in Virginia. (Virginia, New York, Delaware)

Pursuing state legislation to fund wastewater treatment plant upgrades, urban stormwater management and agricultural programs. (Maryland, Virginia, West Virginia)

Implementing a progressive stormwater permit to reduce pollution. (District of Columbia)

Dramatically increasing enforcement and compliance of state requirements for agriculture. (Pennsylvania)

Committing state funding to develop and implement state-of-the-art-technologies for converting animal manure to energy for farms. (Pennsylvania)

Considering implementation of mandatory programs for agriculture by 2013 if pollution reductions fall behind schedule. (Delaware, Maryland, Virginia)

These improvements enabled EPA to reduce and remove most federal backstops, leaving a few targeted backstops and a plan for enhanced oversight and contingency actions to ensure progress. As a result, the final TMDL is shaped in large part by the jurisdictions' plans to reduce pollution, which was a long-standing priority for EPA and why the agency always provided the jurisdictions with flexibility to determine how to reduce pollution in the most efficient, cost-effective and acceptable manner.

Now the focus shifts to the jurisdictions' implementation of the WIP policies and programs that will reduce pollution on-the-ground and in-the-water. EPA will conduct oversight of WIP implementation and jurisdictions' progress toward meeting two-year milestones. If progress is insufficient, EPA is committed to take appropriate contingency actions including targeted compliance and enforcement activities, expansion of requirements to obtain NPDES permit coverage for currently unregulated sources, revision of the TMDL allocations and additional controls on federally permitted sources of pollution, such as wastewater treatment plants, large animal agriculture operations and municipal stormwater systems.

In 2011, while the jurisdictions continue to implement their WIPs, they will begin development of Phase II WIPs, designed to engage local governments, watershed organizations, conservation districts, citizens and other key stakeholders in reducing water pollution."

SECTION 3. DEVELOPMENT OF WATERSHED IMPLEMENTATION PLANS

As part of the EPA TMDL, each jurisdiction is required to develop a Watershed Implementation Plan (WIP), similar to a PCS in that it details how load allocations will be achieved and maintained into the future. Additionally, jurisdictions will have to exhibit accountability by achieving 2-year milestone goals. This process differs from the process previously used in Delaware; DNREC had always been responsible for establishing a TMDL and then developing a PCS. The new approach requires the implementation mechanism to be identified during the TMDL development process. This approach potentially provides EPA with more assurance that jurisdictions have considered their current capacity and future needs. This approach also provides a certain level of assurance to EPA that implementation plans will be developed and executed in a timely manner; however, the success still largely depends on the inclusion of stakeholders throughout the process.

3.1 WIP Development Schedule

Since developing WIPs is a large process that involves a lot of coordination and communication, EPA has allowed the jurisdictions to adopt a three-phase approach (Table 2). Draft Phase I WIPs were submitted on September 1, 2010 and Final Phase I WIPs on November 29, 2010. Phase II WIPs in draft and final forms are due to EPA by December 15, 2011 and March 30, 2012, respectively. Phase III WIPs must be received by EPA in 2017 and will describe refined actions and controls to be implemented between 2018 and 2025 to achieve WQS. With each successive WIP, the detail at which allocations are made will become increasingly specific.

Table 2: Comparison of elements within the Chesapeake Bay TMDL and Phase I, II, and III WIPs

Topic	Bay TMDL	Phase I WIP	Phase II WIP	Phase III WIP
Individual or Aggregate WLAs and LAs to Tidal States	x			
Gross WLAs and Las for Non-Tidal States if those States Submit WIPs that meet EPA Expectations	x			
Loads for individual significant point sources, or, where appropriate, aggregate point sources		x	x	x
Loads for nonpoint source sectors		x	x	x
Proposed actions and, to the extent possible, specific controls to achieve point source and nonpoint source target loads		x	x	x
Point source and nonpoint source loads by local area			x	x
Specific controls and practices to be implemented by 2017		To possible extent	x	
Refined point source and nonpoint source loads				x
Specific controls and practices to be implemented by 2025				x

3.2 Elements of a WIP

3.2.1 Phase I WIPs

EPA identified eight elements that they expect each jurisdiction to address in their Phase I WIPs (Table 3).

Table 3: Eight Elements of a Phase I WIP

Element	Description
1. Interim and Final Nutrient and Sediment Target Loads	WIPs are expected to subdivide Interim and Final target loads by pollutant source sector within each of the 92 areas draining to Section 303(d) tidal water segments, and identify the amount and location of loads from individual or aggregate point sources and nonpoint source sectors (Phase I).
2. Current Loading Baseline and Program Capacity	WIPs are expected to include evaluation of current legal, regulatory, programmatic, financial, staffing, and technical capacity to deliver the target loads established in the TMDL (Phase I).
3. Accounting for Growth	WIPs are expected to describe procedures for estimating additional loads due to growth and provide EPA with information to inform additional pollution load reductions that are at least sufficient to offset the growth and development that is anticipated in the watershed between 2011 and 2025.
4. Gap Analysis	WIPs are expected to identify gaps between current state capacity (Element 2) and the capacity needed to fully attain the Interim and Final nutrient and sediment target loads for each of the 92 drainage areas for impaired segments of the Bay TMDL (Element 1).
5. Commitment and Strategy to Fill Gaps	WIPs are expected to include a proposed strategy to systematically fill the gaps identified in Element 4 (Phase I).
6. Tracking and Reporting Protocols	WIPs are expected to describe efforts currently underway or planned to improve transparent and consistent monitoring, tracking, reporting, and assessing of effectiveness of implementation actions.
7. Contingencies for Slow or Incomplete Implementation	If the proposed strategies outlines in Element 5 are not implemented, WIPs are expected to provide for alternative measures resulting in equivalent reductions and an indication of what such contingencies might entail.
8. Appendix with Detailed Targets and Schedule	WIPs are expected to include detailed Interim and Final load targets for each tidal Bay segment drainage area, source sector, and local area (after November 2011) in an Appendix, with a reduction schedule comprising the two-year target loads at the scale of each major basin within a State or the District. The two-year target loads allow EPA to assess whether future two-year milestones are on schedule to meet interim and final water quality goals.

3.2.2 Phase II WIPs

In guidance from March 30, 2011, EPA explained that since many controls necessary to achieve TMDL allocations must be implemented at the local level by partners, that Phase II WIPs should be developed in collaboration with these groups. Additionally, EPA clarified that the purpose of the Phase II WIPs was to facilitate implementation by focusing on the local partners and resources, propose refinements to TMDL allocations, and demonstrate additional reasonable assurance that TMDL allocations will be achieved and maintained.

EPA also identified six elements that they expect Phase II WIPs to include:

1. Identification of key local, state, and federal partners involved in nutrient and sediment reductions
2. Identification of how each jurisdiction is working with key partners to identify their roles and how they have been involved in the development and implementation of the WIP
3. Strategies to help facilitate implementation by local partners including how and when actions will be implemented
4. Clear, quantitative goals identifying the level and location of controls that will be in place by 2017 and 2025.
5. Descriptions of how progress by local partners will be tracked, verified, and reported
6. How jurisdictions are working with federal agencies

3.3 Consequences and Contingencies

If jurisdictions fail to develop their WIP or meet their 2-year milestone goals, EPA has identified a set of potential consequences to impose. These consequences include the possibility of EPA instituting backstop allocations, taking over responsibility for developing WIPs, and EPA increasing their regulatory oversight and extending their regulatory authority to additional sources of pollution. EPA may deny National Pollutant Discharge Elimination System (NPDES) permits or require additional reductions from regulated sources, increase and target federal enforcement and compliance, and expand NPDES coverage to currently unregulated sources. Examples of currently unregulated sources in many locations include Concentrated Animal Feeding Operations (CAFO) in the agriculture community and Municipal Separate Stormwater Systems (MS4s) in the developed community. Additionally, EPA may condition or redirect grant funds the states rely on to implement voluntary cost-share programs. Considering the potential consequences, jurisdictions must not only identify actions that are immediately available for them to implement, but also identify contingencies. These contingencies include additional actions that they may have to turn to if the original actions are not successfully implemented, or do not result in the anticipated nutrient and sediment reductions.

Following Delaware's Draft Phase I WIP submission on September 1, 2010, EPA reviewed the document and determined that "serious deficiencies" existed. Most specifically, the specific actions that the WIP identified did not go far enough to achieve the necessary load reductions for nitrogen and phosphorus. EPA identified several areas related to wastewater treatment plants, municipal stormwater, and concentrated animal feeding operations that they were prepared to institute backstop allocations for if the final Delaware Phase I WIP was unsuccessful in closing the gaps. Delaware's Final Phase I WIP was submitted to EPA on November 29, 2010 and met the nutrient and sediment allocations in the final TMDL, which was established on December 29, 2010. In fact, the actions specified in Delaware's Phase I WIP model input decks resulted in statewide loads that were 3%, 12%, and 33% under Delaware's nitrogen,

phosphorus, and sediment allocations, respectively. Delaware agreed to apply the spare pounds back to the nonpoint source agriculture allocation and the implementation measures have been refined in this Phase II WIP.

3.4 Delaware's Chesapeake Interagency Workgroup

The public plays a crucial role in the development of the Chesapeake WIP. There are numerous stakeholders in the Chesapeake drainage in Delaware. Because most of the land area is used for agriculture, area farmers are especially concerned about implications of new or revised agriculture requirements and goals. Developers, landowners, and local governments are interested in how a Chesapeake TMDL and WIP affect opportunities for growth. Existing homeowners have concerns about requirements for on-site wastewater treatment and disposal systems and their ability to fertilize their yards and gardens. Additionally, environmentalists are interested in how the State is going to address environmental issues. The public also includes long-time citizens of the area, ample in experience and advice on what they have seen, and what they would like to see in the future for Delaware's portion of the Chesapeake.

In order to achieve these requirements and an aggressive schedule, DNREC convened the Chesapeake Bay Interagency Workgroup made up of representatives from each DNREC Division, Department of Agriculture, Department of Transportation, Office of State Planning Coordination, County Conservation Districts, US Department of Agriculture, and other stakeholders. The Interagency Workgroup first met in January 2010.

Within the Workgroup, eight subcommittees were formed to address: Agriculture; Stormwater; Wastewater; Land Use and Comprehensive Plans; Restoration; Public Lands; Funding; and Information Technology. A ninth committee focused on communications formed during the development of the Phase II WIP. Subcommittees have been tasked with recommending and reviewing sub-allocating methodologies to the various point and nonpoint sources within the basins, assessing current data tracking and reporting systems, determining maximum implementation goals and methods to fill program and funding gaps, and assisting with writing and providing information for the WIP. Subcommittees have been and will continue communicating proposed actions to respective stakeholder groups, and soliciting their input on WIP elements. During the Phase I WIP development, the subcommittees met routinely, or as needed, to accomplish these tasks. During the Phase II process, subcommittee chairs attempted to provide the initial round of text updates through consultation with their groups.

Each subcommittee of the Chesapeake Interagency Workgroup has focused on developing a particular section of the WIP. The general composition of each subcommittee is provided at the beginning of each section, and a list of the individuals that participated in each group can be found in Appendix B.

SECTION 4. INTERIM AND FINAL NUTRIENT AND SEDIMENT LOAD TARGETS

The nutrient and sediment loads in Table 4 below were allocated to the State of Delaware for the Phase I WIP and can be found in Appendix Q of EPA's TMDL. These loads will be distributed among the various point and nonpoint sources of pollutants according to the specifications outlined in the following sections.

Table 4: Interim and Final Nutrient and Sediment Loads from Delaware (Phase I WIP and 2010 TMDL)

	Nitrogen Load (pounds/year)	Phosphorus Load (pounds/year)	Sediment Load (pounds/year)
2009 Load	4,147,086	315,358	64,778,567
2017 Interim Load (60% of 2025 Load)	3,429,386	283,228	60,605,240
2025 Final Load	2,950,920	261,808	57,823,022
% Reduction between 2009 and 2025	29%	18%	10%

Since the TMDL establishment on December 29, 2010, EPA refined the Watershed Model, resulting in more accurate estimates of urban and suburban lands and more credit for nutrient management on agricultural lands. These refinements also resulted loading changes to past progress runs and new planning targets for the Phase II WIPs, which can be found in Table 5 below.

Table 5: Interim and Final Nutrient and Sediment Loads from Delaware (Phase II WIP Planning Targets)

	Nitrogen Load (pounds/year)	Phosphorus Load (pounds/year)	Sediment Load (pounds/year)
2009 Load	4,474,253	345,140	98,946,818
2017 Interim Load (60% of 2025 Load)	3,824,331	304,155	99,455,089
2025 Final Load	3,391,05	276,832	99,793,936
% Reduction between 2009 and 2025	24%	20%	-1%

4.1 Process for Developing WLAs and LAs

The April 2, 2010 Guidance from EPA, specifically Appendices 1 and 2, was consulted to sub-allocate the above loads between the various point and nonpoint sources. Each Chesapeake Interagency Workgroup subcommittee representing a source sector contributed to the process. The Wastewater Subcommittee recommended wasteload allocations for the major and minor municipal and industrial wastewater treatment plants, the Stormwater Subcommittee recommended a policy for assigning all stormwater related loads to

the wasteload allocation, and the Agriculture Subcommittee provided information and guidance on allocating loads from animal operations between those that are regulated (receiving a wasteload allocation) and those that are not (receiving a load allocation).

4.2 Waste Load Allocations or Practices to Include in Permits

4.2.1 Wastewater

4.2.1.1 Significant Wastewater Facilities

The waste load allocations for the significant wastewater facilities in Delaware's portion of the Chesapeake can be found in Table 6 below and are part of the EPA December 29, 2010 TMDL (see their Appendix Q). The table includes the permitted design flow, proposed concentrations, and corresponding annual loads for Total Nitrogen (TN), Total Phosphorus (TP), and Total Suspended Solids (TSS).

Significant municipal wastewater facilities have a design flow greater than or equal to 0.4 million gallons per day. Significant industrial wastewater facilities have total nitrogen loadings of 27,000 pounds per year, and 3,800 pounds per year for total phosphorus.

Table 6: Wasteload Allocations for Significant Wastewater Facilities (Edge of Stream Loads – EPA TMDL App. Q)

CB 303(d) Seg	NPDES	Outfall	Flow (mgd)	BOD5 (mg/l)	Total Nitrogen		Total Phosphorus		Total Suspended Solids	
					Conc. (mg/L)	WLA (lb/year)	Conc. (mg/L)	WLA (lb/year)	Conc. (mg/L)	WLA (lb/year)
NANTF_DE	DE0020249 – Bridgeville (1)	001	0.8	12	4.0	9,746	1.0	2,436	15	36,547
NANTF_DE	DE0020125 – Laurel (1)	001	0.7	8.7	4.0	8,528	1.0	2,132	15	31,978
NANTF_DE	DE0020265 – Seaford (1)	001	2.0	12	4.0	24,364	1.0	6,091	8.0	48,729
NANTF_DE	DE0000035 – Invista (2)	011	16.4	3.0	3.44	171,818	0.0	0.0	15	749,208
Subtotal						214,456		10,659		866,462

(1) Flow is based on current design; BOD5 is based on current flow limit and BOD5 load limit; TN and TP are based on current flow limit and proposed concentrations of 4.0 mg/L TN, and 1.0 mg/L TP.

(2) Flow is average for 2009; BOD5 based on current BOD5 load limit and average 2009 flow; TN conc. based on 60% reduction from current permitted load and ave. 2009 flow; TP is a net load.

4.2.1.2 Non-significant Municipal and Industrial Facilities

The aggregate wasteload allocation for the non-significant municipal and industrial facilities in Delaware's portion of the Chesapeake can be found in Table 7 below and are part of the EPA December 29, 2010 TMDL (see their Appendix Q). The table includes the permitted design flow and concentrations for Total Nitrogen (TN), Total Phosphorus (TP), and Total Suspended Solids (TSS).

Table 7: Aggregate Wasteload Allocations for Non-Significant Municipal and Industrial Facilities (Edge of Stream Loads- EPA TMDL App. Q)

CB 303(d) Seg	NPDES	Outfall	Flow (mgd)	BOD5 (mg/l)	Total Nitrogen		Total Phosphorus		Total Suspended Solids	
					Conc. (mg/L)	WLA (lb/year)	Conc. (mg/L)	WLA (lb/year)	Conc. (mg/L)	WLA (lb/year)
NANTF_DE	DE0050725- Mobile Gardens (1)	001	0.06	15	13.2	2,414	1.8	322	15	1,096
NANTF_DE	DE0050971- BASF (1)(2)	001	0.8	0	2	2,234	0.0	0	4.0	4,891
Subtotal						7,285		329		12,487

(1) Flow is based on current design; BOD5 is based on current flow limit and BOD5 load limit; TN and TP are based on current flow limit and load limits from the Nanticoke TMDL.

(2) The BASF NPDES discharge was officially terminated on March 31, 2011.

4.2.2 Stormwater (Construction, Post-Construction, MS4, and Industrial)

In the EPA Memorandum dated 22 November 2002, the Appendix regarding establishment of a TMDL Waste Load Allocation (WLA) is cited. It is clear that the intent of the EPA was to ensure the regulated point-source discharges within a Municipal Separate Stormwater Sewer System (MS4) would be addressed by the WLA component of a TMDL. The memo also stated that stormwater discharges from sources not regulated by the National Pollutant Discharge Elimination System (NPDES) program may be addressed by a load allocation component of a TMDL. This seems not to rule out the possibility that a non-NPDES regulated stormwater discharge could also be addressed by the WLA component. This is the strategy that Delaware would like to use in the Chesapeake WIP for issues related to stormwater from developed and developing urban and suburban lands.

When land is developed, the construction phase of that development is regulated by an NPDES Construction General Permit until the site is stabilized and completed. That stormwater discharge would be a WLA for the TMDL in that watershed. The post-construction stormwater discharge from these developed lands would still be counted as a WLA for the following reasons:

- Only a small land area in Delaware, and a much smaller land area in the Chesapeake, is subject to a MS4 permit program requirement. However, Delaware has statewide requirements for all land development, including post construction stormwater runoff, to meet requirements for water

quality. These state regulations are currently being revised to reflect the need to meet the TMDL load reductions whether in an MS4 or not.

- Many of the developed areas in the state discharge to a publically owned drainage or stormwater conveyance system even outside the current MS4 areas. This seems to be one of the criteria EPA uses for determining if a stormwater discharge is regulated. If the goal is to be consistent with determining types of stormwater discharges associated with various runoff conditions, there is no difference between the runoff from a developed area within the MS4 and outside the MS4.
- It will be much easier and much more consistent to apply the WLA uniformly across all urban and suburban lands because Delaware regulates land development of all types in all areas. The land uses will be broken down between commercial or non-residential and residential, establishing specific strategies to reach the target load reductions. These lands will be further broken down to those that were developed before 1991 when the Delaware stormwater regulations became effective and the lands developed under the current regulations and those lands that will be developed under future regulations.

Delaware requested to have all of the urban/suburban lands and the stormwater discharges associated with them (construction, post-construction, MS4, and industrial) addressed by the WLA component of the TMDL for the Chesapeake Bay watershed. Table 8 shows the aggregated wasteload allocations for regulated stormwater in the EPA December 29, 2010 TMDL (see their Appendix Q).

Table 8: Aggregate Wasteload Allocations for Regulated Stormwater (Delivered Loads- EPA TMDL App. Q)

CB 303(d) Seg	Total Nitrogen	Total Phosphorus	Total Suspended Solids
	WLA (lb/year)	WLA (lb/year)	WLA (lb/year)
ELKOH	2,193	317	31,854
C&DOH_MD	15,427	2,323	336,975
C&DOH_DE	5,787	897	140,066
BOHOH	5,059	807	65,521
SASOH	266	42	5,525
CHSTF	1,375	247	93,984
CHOTF	3,425	892	361,329
NANOH	3,941	765	360,997
NANTF_DE	87,249	13,720	10,010,082
POCTF	1,045	271	65,520
WICMH	1,894	293	104,196
Subtotal	127,661	20,574	11,573,049

4.2.3 Concentrated Animal Feeding Operations (CAFOs)

Delaware estimated the number of animal operations within the Chesapeake and provided EPA with the number by subwatershed that should be considered an AFO and those that should be a CAFO. It appears however that EPA relied on the number of operations that had officially submitted a Notice of Intent (NOI) for a CAFO permit by February 2009 to calculate the loads from Delaware CAFO operations. These values were aggregated and included as a WLA in EPA's December 29, 2010 TMDL (see their Appendix Q) (Table 9).

Table 9: Aggregate Wasteload Allocations for Regulated Agriculture (Delivered Loads- EPA TMDL App. Q)

CB 303(d) Seg	Total Nitrogen	Total Phosphorus	Total Suspended Solids
	WLA (lb/year)	WLA (lb/year)	WLA (lb/year)
ELKOH	0	0	0
C&DOH_MD	0	0	0
C&DOH_DE	0	0	0
BOHOH	0	0	0
SASOH	0	0	0
CHSTF	599	57	0
CHOTF	2,051	209	169
NANOH	2,313	218	65
NANTF_DE	10,555	888	5
POCTF	558	56	0
WICMH	32	3	0
Subtotal	16,108	1,431	239

Since the Phase I WIP and the TMDL, EPA has made some model updates and CAFO data was included. According to communications with the modeling staff, 2009 and 2010 animal data reflect an extrapolation from 2007 agriculture census data. The numbers of operations or animals provided by the states were incorporated as a percentage of the total animals to be attributed to CAFOs and the WLA. State data was summed to the county scale to match Scenario Builder's agriculture census data and applied to the agriculture census total. Upon reviewing this new data, members of the Agriculture Subcommittee are uncertain if this methodology is accurately reflecting the true AFO/CAFO breakout in Delaware and will continue to work with EPA to make any necessary corrections.

4.2.4 Resource Extraction

Resource extraction is not considered to be a significant source in Delaware; all current active borrow pit areas have been designed to have zero discharge. If a new facility is proposed for the future with a potential water discharge, an industrial discharge permit would be required and captured under the industrial permit category.

4.3 Load Allocations

Tables 10-12 below show the load allocations by 303(d) segment and source sector. These values are part of the EPA December 29, 2010 TMDL (see their Appendix Q) and were determined through supplying the EPA-Chesapeake Bay Program watershed model with best management practice implementation scenarios that are expected to occur by 2025. The load reductions resulting from the implementation of these practices reduces the loads from each contributing segment to the values found in the tables below.

Table 10: Nitrogen Load Allocations (lb/year) (Delivered Loads- EPA TMDL App. Q)

CB 303(d) Seg	Agriculture	Unregulated Stormwater	Septic	Forest	Non-Tidal Water Deposition	Subtotal
ELKOH	1,851	-	4,612	1,849	-	8,312
C&DOH_MD	18,996	-	13,629	5,207	195	38,028
C&DOH_DE	9,489	-	1,763	2,873	705	14,830
BOHOH	22,771	-	4,200	3,949	150	31,069
SASOH	19,300	-	1,365	5,193	9	25,867
CHSTF	74,509	-	11,194	22,667	190	108,560
CHOTF	180,748	-	23,604	42,226	460	247,037
NANOH	247,407	-	19,401	55,214	408	322,431
NANTF_DE	1,299,204	-	120,554	253,453	16,776	1,689,986
NANTF_MD	183	-	26	23	-	231
POCTF	70,179	-	3,749	17,888	17	91,833
WICMH	5,202	-	613	795	-	6,610
Subtotal	1,949,838	-	204,709	411,338	18,910	2,584,795

Table 11: Phosphorus Load Allocations (lb/year) (Delivered Loads- EPA TMDL App. Q)

CB 303(d) Seg	Agriculture	Unregulated Stormwater	Septic	Forest	Non-Tidal Water Deposition	Subtotal
ELKOH	315	-	-	126	-	441
C&DOH_MD	3,234	-	-	335	11	3,601
C&DOH_DE	1,618	-	-	196	41	1,855
BOHOH	3,857	-	-	269	9	4,134
SASOH	3,275	-	-	354	1	3,629
CHSTF	11,038	-	-	1,741	12	12,791
CHOTF	27,918	-	-	3,580	32	31,531
NANOH	29,415	-	-	3,969	16	33,399
NANTF_DE	113,315	-	-	14,781	619	128,715
NANTF_MD	17	-	-	1	-	18
POCTF	6,980	-	-	1,231	1	8,212
WICMH	449	-	-	47	-	496
Subtotal	201,432	-	-	26,651	740	228,823

Table 12: Sediment Load Allocations (lb/year) (Delivered Loads– EPA TMDL App. Q)

CB 303(d) Seg	Agriculture	Unregulated Stormwater	Septic	Forest	Non-Tidal Water Deposition	Subtotal
ELKOH	51,700	-	-	12,685	-	64,385
C&DOH_MD	775,339	-	-	49,747	-	825,087
C&DOH_DE	387,265	-	-	27,483	-	414,748
BOHOH	493,334	-	-	21,327	-	514,661
SASOH	602,721	-	-	39,950	-	642,671
CHSTF	2,573,914	-	-	286,984	-	2,860,897
CHOTF	5,578,621	-	-	603,444	-	6,182,065
NANOH	5,517,453	-	-	706,072	-	6,223,525
NANTF_DE	23,720,201	-	-	3,536,550	-	27,256,751
NANTF_MD	597	-	-	83	-	680
POCTF	328,326	-	-	78,631	-	406,956
WICMH	34,752	-	-	5,247	-	39,998
Subtotal	40,064,222	-	-	5,368,203	-	45,432,425

4.4 Temporary Reserve

EPA requested that the jurisdictions incorporate a 5% Temporary Reserve into the final Phase I WIPs since they were planning to refine the watershed model prior to Phase II WIPs. The actions specified in Delaware's Phase I WIP model input decks resulted in statewide loads that were 3%, 12%, and 33% under Delaware's nitrogen, phosphorus, and sediment allocations, respectively. Because Delaware had established adequate reserves, the Phase I WIP was still able to achieve the new planning targets that resulted from the 2011 model refinements. During the Phase II process, Delaware plans to apply spare pounds back to the nonpoint source agriculture allocation by adjusting implementation measures.

4.5 Interim Load Reductions

EPA also expected the Final Phase I WIP to identify the load reductions that Delaware will achieve every two years, beginning in 2011 on a major basin, or in Delaware's case a state-wide, basis. Additionally, in 2017, EPA is requesting that the loads be broken down by sector.

Implementation rates will vary across source sectors. Delaware has proposed in this WIP to allow the wastewater treatment plant point sources to increase their loads over time by allowing the facilities to grow to their permitted volume capacity. This increase in loads will occur gradually over time and depends on the economy and local growth patterns. Growth projections by both EPA and the University of Delaware project growth to occur at a relatively steady rate between 2010 and 2017 and 2025 in Delaware's portion of the Chesapeake.

The Agriculture Subcommittee believes implementation of practices in the agriculture sector and hence their load reductions will be steady, or linear, over time, although early efforts may be focused on several practices. Since several agriculture best management practices result in land conversion, the loads from forested and natural areas will increase at the same rate due to the land use conversions. The Stormwater Subcommittee anticipates that reductions of loadings from the existing urban runoff lands, which will result

from redevelopment and retrofit opportunities as they occur, are likely to be slow in the near term and accelerate in the future (depending on the availability of funds for retrofit projects and the cost-effectiveness of those projects); however for this analysis, a linear reduction is assumed.

For onsite wastewater treatment and disposal (septic) systems, the rates of implementation must be collectively considered for three different practices. First, several thousand existing septic systems are expected to be eliminated between now and 2025; the majority (70%) will likely occur by 2017 based on local annexation plans and schedules; however, this depends on the economy and growth. Second, a statewide pump-out and inspection program will be instituted in 2013 and reductions from this program will gradually increase and then become steady over time. Finally, advanced treatment will be required (pending passage of a new regulation) for onsite systems within a certain proximity to tidal waters and associated tidal wetlands when those systems fail, so reductions resulting from this practice will not occur until further in the future. Taken together, reductions from existing septic systems will likely occur steadily over time.

Given that Delaware is dependent on the actions of the jurisdictions to our west with respect to reductions associated with non-tidal water deposition, it is difficult to predict how and when these reductions will occur. Until better information is provided, a linear reduction is assumed.

The tables below show the nitrogen, phosphorus, and sediment loads between 2009 and 2025. The 2009 and 2010 values were calculated by Phase 5.3.2 of the watershed model as progress runs. The 2013, 2017, and 2025 values are based on modeled Phase 2 WIP and Milestone input decks. The total loads for the other milestone years between 2010 and 2025 were estimated using linear interpolation. The target loads for 2017 and 2025 are indicated below each table.

Table 13: Total Nitrogen Two-Year Milestone Loads (lbs/year)

TN (lbs/yr)	Point Source	Agriculture	Urban Runoff	Septic	Forest	Non-Tidal Water Deposition	All Sources
2009 ^a	141,000	3,448,962	389,661	154,877	322,148	17,604	4,474,253
2010 ^a	53,610	3,400,845	382,215	156,940	320,387	17,604	4,331,600
2011							4,353,096 ^c
2013 ^b	217,046	3,300,162	371,530	154,622	355,122	17,604	4,396,087
2015							4,128,826 ^c
2017 ^b	217,046	2,818,916	354,269	120,048	333,680	17,604	3,861,564 ^d
2019							3,717,029 ^c
2021							3,572,493 ^c
2023							3,427,957 ^c
2025 ^b	217,046	2,277,229	337,009	97,939	336,595	17,604	3,283,422 ^e

a-Values based on progress runs.

b-Values based on Phase 2 WIP and Milestone input decks.

c-Interpolated value.

d-Phase 2 WIP Target of 3,824,331

e-Phase 2 WIP Target of 3,391,050

Table 14: Total Phosphorus Two-Year Milestone Loads (lbs/year)

TP (lbs/yr)	Point Source	Agriculture	Urban Runoff	Septic	Forest	Non-Tidal Water Deposition	All Sources
2009 ^a	5,530	310,639	20,868	0	7,411	692	345,140
2010 ^a	5,571	300,333	20,878	0	7,381	692	334,854
2011							325,462 ^c
2013 ^b	10,997	267,597	19,677	0	7,714	692	306,677
2015							287,437 ^c
2017 ^b	10,997	229,880	18,957	0	7,671	692	268,198 ^d
2019							260,101 ^c
2021							252,004 ^c
2023							243,907 ^c
2025 ^b	10,997	198,159	18,238	0	7,724	692	235,810 ^e

a-Values based on progress runs.

b-Values based on Phase 2 WIP and Milestone input decks.

c-Interpolated value.

d-Phase 2 WIP Target of 304,155

e-Phase 2 WIP Target of 276,832

Table 15: Total Suspended Solids Two-Year Milestone Loads (lbs/year)

TSS (lbs/yr)	Point Source	Agriculture	Urban Runoff	Septic	Forest	Non-Tidal Water Deposition	All Sources
2009 ^a	202,599	63,944,699	28,844,315	0	5,955,244	0	98,946,818
2010 ^a	25,920	60,201,715	30,558,647	0	5,892,496	0	96,678,778
2011							91,152,326 ^c
2013 ^b	869,917	44,990,117	27,682,062	0	6,557,326	0	80,099,422
2015							77,978,076 ^c
2017 ^b	869,917	41,234,173	27,505,829	0	6,246,811	0	75,856,730 ^d
2019							74,847,825 ^c
2021							73,838,921 ^c
2023							72,830,016 ^c
2025 ^b	869,917	37,365,581	27,329,592	0	6,256,020	0	72,821,111 ^e

a-Values based on progress runs.

b-Values based on Phase 2 WIP and Milestone input decks.

c-Interpolated value.

d-Phase 2 WIP Target of 99,455,089

e-Phase 2 WIP Target of 99,793,936

It should be noted that the annual loading values shown by source sector in 2017 and 2025 are only appropriate when assuming 2010 land use stays the same, which is obviously not going to be the case. As land use changes from agriculture to developed, more of the nonpoint load will come from those developed

source sectors (urban runoff, septic). The total load or the load per acre in those years, however, will not increase as a result of the offset program that is slated to be developed. It is Delaware's understanding that analyses using the Chesapeake Bay Programs land use and population change model for 2017 and 2025 will eventually be made available and modifications to the tables above will be made upon considering the results of those analyses. Additionally, the Land Use Subcommittee is partnering with the University of Delaware to use the CommunityViz model to examine land use changes likely to occur with the Chesapeake through 2025, which may be used to adjust the values in the table above in the future.

SECTION 5. WASTEWATER

The Wastewater Subcommittee of Delaware's Chesapeake Interagency Workgroup assembled this section of the WIP. Members of the Wastewater Subcommittee have positions within DNREC, and come from both the Groundwater Discharges Section and Surface Water Discharge Section. With respect to wastewater treatment facilities, they have experience in developing and managing NPDES permits for municipal and industrial wastewater discharges and point source discharge TMDL compliance.

5.1 Current Programs and Capacity

5.1.1 NPDES

Under Section 402 of the federal Water Pollution Control Act (Clean Water Act) and Delaware Code of Law, Title 7, Part VII, Chapter 60, "Environmental Control," , any discharge of pollutants from a point source to state surface waters is unlawful unless sanctioned by a permit. Such permits are administered under the NPDES program. The fundamental goal of an NPDES permit is just that, to eliminate discharge of pollutants. Federal and state regulations promulgated pursuant to these statutes are the regulatory basis for permit issuance. The EPA has delegated its authority to administer the federal NPDES permit program in Delaware to the State of Delaware, with the exception of pre-treatment and federal facilities. Five wastewater treatment plants located within the Chesapeake Bay Watershed are currently permitted to have nutrient and sediment discharges. Other known sources of nutrients and sediment subject to NPDES regulations are covered in other sections of this document, and include Industrial Stormwater and MS4 (Chapter 7) and Concentrated Animal Feeding Operations (CAFOs), Chapter 9.

5.1.2 Surface Water Discharges Section

The SWDS regulates point sources of pollution, which include municipal and industrial wastewater treatment systems and their construction, Biosolids applications, Concentrated Animal Feeding Operations (CAFO), Aquatic Pesticide Applications and stormwater discharges associated with industrial activities. This section also provides support to the [Board of Certification for Wastewater Operators](#), where technical assistance is provided directly to wastewater treatment facilities to assist with facility operations. The SWDS is responsible for eliminating pollutant discharges into State surface waters by issuing regulatory permits under the NPDES. A NPDES permit legally sanctions the discharge of substances that may become pollutants. However, the NPDES permit is designed to limit the discharge of those substances so that there will be no adverse effect on the quality of the receiving waters, or interference with the designated uses of those waters. The health of a water body is measured by its attainment of designated uses. If potential pollutants in a NPDES discharge are reduced to levels that allow receiving waters to meet applicable designated uses, then, in effect, the pollutant discharge has been eliminated. Municipal sewage treatment or industrial plants that discharge wastewater to surface waters of Delaware are issued permits specifying discharge limitations, monitoring requirements, and other terms and conditions that must be met. In addition to wastewater, wastewater facilities often generate a waste sludge solid that is also an NPDES discharge under federal and State regulations.

The SWDS contains five branches: the Compliance and Enforcement Branch, Wastewater Residuals Branch, Storm Water Branch, the Discharges Permits Branch, and Wastewater Facilities Construction Branch.

The Compliance and Enforcement Branch conducts assessments of wastewater treatment facilities to ensure compliance with applicable permits and recommends enforcement as necessary in order to protect surface water quality. The Branch is also the liaison to the Wastewater Operator Board of Certification responsible for the issuing of Wastewater Operator Licenses. All "major" and fifty percent (50%) of the "minor" permitted wastewater facilities statewide receive an annual on-site inspection as well as an audit of their monitoring records conducted by the Compliance and Enforcement Branch. The Compliance Inspections are conducted in accordance with EPA form 3560-3 and include:

- Complete inspection of the entire Wastewater treatment process from the "Headworks" (where the raw sewage or process wastewater comes in) to the discharge effluent and everything in between. We ensure that all equipment is operating and that the treatment system is functioning as shown in the facility's NPDES Permit;
- Take pictures to document any situation that is an improvement or something that may be of concern;
- Verify all records are maintained for a minimum of three (3) years;
- Verify data and calculations by randomly choosing a Discharge Monitoring Report from sometime in the past three years, and reviewing and verifying each individual data entry. The entry is traced all the way back to the raw data supplied by the lab and the calculations for "loading" quantities are verified.
- All required training and inspections must be documented and these are verified as appropriate;
- Document proper calibration of flow meters, thermometers, and laboratory instrumentation;
- Document that all persons operating in the wastewater treatment process are properly licensed and that all licensing is current and valid;
- Verify that all sampling is completed as directed in the facility's NPDES Permit, that proper sample preservation was maintained, that proper holding times were utilized, and that the proper approved analytical method was used to analyze the samples;
- Verify sample compositors to be sure that they are properly calibrated and maintained at the proper temperature (must have documented evidence of these events);
- If facility is required to have a Storm Water Plan and/or and SPCC, we verify that the plan is properly approved, authorized, and signed off by top plant management and by a PE (where required). We also inspect areas where there is any storage of chemicals to ensure that any potential for accidental discharge of chemicals or oils is minimized and that proper precautions and procedures are in place to address any emergency situation;
- Hold a closing meeting with operations and management to review findings of the inspection;
- Provide a follow-up letter (and a Manager's Deficiency Warning Letter, NOV, etc. if warranted) to the facility. If deficiencies are found, they are fully described in the letter, along with corrective action(s) that may be needed, and a date when the corrective action must be completed.

For wastewater treatment plants, penalties for noncompliance include but are not limited to: manager's warning letter, notice of violation (NOV), and Secretary Order. Wastewater treatment plants cannot be issued a cease and desist to shut down.

As of February 2012 all of the five NPDES facilities in the Chesapeake Bay Watershed have been inspected by the Compliance and Enforcement Branch and found to be in compliance with the permit requirements. Inspection dates are: Mobile Gardens December 3, 2010, Bridgeville May 18, 2011, Laurel May 24, 2011, Seaford May 25, 2011, and Invista September 13, 2011.

The Wastewater Residuals Branch is responsible for the Biosolids Program. The Biosolids Program issues permits and ensures compliance for the Land Application and the Distribution & Marketing of Biosolids. In addition this Branch is also responsible for the Concentrated Animal Feeding Operations (CAFO) regulation which is administered in cooperation the Delaware Department of Agriculture (DDA).

The Storm Water Permit Branch is responsible for the NPDES permitting and compliance of industrial stormwater, Phase I permits, Phase II permits, and MS4s. In addition this Branch is also responsible for the General NPDES permit program for Aquatic Pesticide applications scheduled to be promulgated in 2012.

The Discharges Permits Branch is responsible for reviewing, writing, and issuing NPDES permits (Non Storm Water Permits).

The Wastewater Facilities Construction Branch conducts the review of plans and issues permits for the construction of wastewater collection, transmission and treatment systems.

5.1.3 The Compliance and Enforcement Response Guide

The Compliance and Enforcement Response [Guide](#), originally drafted in 2002, was developed primarily to assist DNREC managers and staff in developing comprehensive compliance assurance strategies and in designing appropriate case-specific enforcement strategies. Its publication will also serve to inform the regulated community, elected officials and general public about the manner in which the Department intends to conduct its compliance and enforcement activities. The Guide establishes a framework for the Department's compliance and enforcement activities by setting forth the goals, principles and processes. Its development was the result of an internal review to improve the consistency, efficiency, and effectiveness of its enforcement activities and to promote a centralized process for coordination on air, waste, water, and other environmental violations.

This guide is in the process of being updated by the Compliance and Enforcement Response Guide (CERG) Workgroup. In January 2012 a revised DRAFT version of the CERG was submitted to EPA for review.

5.2 Accounting for Growth

Growth is expected across the Chesapeake, impacting communities with wastewater treatment systems and will be covered more fully in Chapter 8, Landuse. All of the permitted communities have communicated with the Department that significant financial hardship will result if unfunded upgrades are mandated or required.

Short term growth for Seaford and Laurel, which are both operating at about fifty percent (50%) of their capacity, may be accommodated within the proposed allocated loads; however, longer term growth will be problematic for these communities without significant treatment plant upgrades.

Future growth for Bridgeville can be accommodated within the proposed loads though plant upgrades and/or increasing the amount land applied effluent. Although the Bridgeville facility currently exceeds the proposed loads for TN, the Department is committed to working with the Town to find solutions to meet allocated loads through the NPDES permit process. The Town is currently reviewing several options to identify realistic and obtainable ways to meet the WLA. The Town and the Department are committed towards working together to find a solution.

The proposed TN Load for Invista is based on a 60% reduction from their current permitted load which was based on the Nanticoke TMDL. This load should accommodate any anticipated growth for the facility. Invista has indicated that they would like to increase their TP allocation from 0 mg/L to 1 mg/L to accommodate future growth. This increase could have a major impact on local waterways. The current TMDL limit prohibits them from having a phosphorous load.

The Nutrient load from Mobile Gardens is insignificant, and is proposed to remain at the current permitted levels for both TN and TP. The NPDES permit for BASF has been voided based on a request from the permittee. BASF no longer discharges wastewater to the Chesapeake Bay Watershed. Nutrient allocations for TN and TP could be allocated to other point sources in the watershed. The TN reduction in the Chesapeake Bay watershed by eliminating the BASF (DE0050971) point source is estimated at 2,234 lbs/year.

Tables 16-18 below show the difference between current loads and proposed loads for the five wastewater facilities in Delaware's Chesapeake watershed: Bridgeville Sewage Treatment Plant (STP), Laurel STP, Seaford STP, Invista, and Mobile Gardens. In each table, the actual loads are based on the maximum loads from recent discharge monitoring report (DMR) values. Proposed nutrient loads for Bridgeville, Laurel and Seaford are based on the current flow limit and proposed concentrations of 4.0 mg/L TN and 1.0 mg/L TP. Proposed nutrient loads for Invista are based on a 60% reduction from the current permitted TN load and the current permitted net load for TP. Proposed nutrient loads for Mobile Gardens are based on the current NPDES Permit Effluent Limitations. Proposed TSS loads for all facilities are based on the current NPDES Permit Effluent Limitations.

Table 16: CY09 and Proposed Total Nitrogen (TN) Loads (lbs/year) and Room for Growth

NPDES Permit Number	Facility Name	Annual TN Load		
		Actual	Proposed	Difference
DE0020249	Bridgeville STP	19,237	9,747	(- 9,490)
DE0020125	Laurel STP	6,653	8,529	1,876
DE0020265	Seaford STP	18,065	24,367	6,302
DE0000035	Invista	110,067	172,000	62,213
DE0050725	Mobile Gardens	813	2,414	1,601

Table 17: CY09 and Permitted Phosphorus (TP) Loads (lbs/year) and Room for Growth

NPDES Permit Number	Facility Name	Annual TP Load		
		Actual	Proposed	Difference
DE0020249	Bridgeville STP	3,918	2,437	(-1,481)
DE0020125	Laurel STP	1,256	2,132	876
DE0020265	Seaford STP	4,562	6,092	1,530
DE0000035	Invista	0	0	0
DE0050725	Mobile Gardens	248	322	74

Table 18: CY09 and Permitted Total Suspended Sediment (TSS) Loads (lbs/year) and Room for Growth

NPDES Permit Number	Facility Name	Annual TSS Load		
		Actual	Proposed	Difference
DE0020249	Bridgeville STP	5,630	36,547	359,370
DE0020125	Laurel STP	3,335	32,210	28,875
DE0020265	Seaford STP	5,165	49,275	44,110
DE0000035	Invista	395	2,053	1,658
DE0050725	Mobile Gardens	181	1,277	1,096

Local water quality will be maintained and local TMDLs will be met despite these anticipated new or increased loads from point sources. The increasing loads from wastewater treatment plants will be routinely monitored through DMRs, which are submitted monthly and reviewed by compliance staff.

As growth occurs and the volume and loading from the facilities nears the levels proposed above, one of two scenarios is likely to play out. The facilities may include or transition to spray irrigation of their wastewater, which in Delaware, is considered a beneficial reuse. Alternatively, the facilities can engage in some sort of credit exchange program, which is currently being investigated and developed in the State.

5.3 Gap Analysis

For WWTPs, the compliance and participation rates are near 100%, and are actively being maintained. No additional regulatory or enforcement authorities are needed to meet these compliance and implementation rates. There is currently a mandate to submit water quality data. Existing benchmarks are being modified into stricter, more heavily enforced limits.

Currently, all the “major” and 50% of the “minor” permitted wastewater facilities receive on site inspection as well as an audit of their monitoring records on an annual basis by the Division of Water, Surface Water Discharges Section, Compliance and Enforcement Branch. The recent hiring of a full time permit writer puts Section staffing at a level that is sufficient to keep up with current permit issuance demands. With the additional workload of the NPDES Pesticides General Program and the Chesapeake TMDL the Section will make minimum progress on the current permit backlog. The Section applied for and received funding from the Chesapeake Bay Regulatory and Accountability Grant which was used to hire one contractual employee. The new employee has been utilized to offset the workload from the Chesapeake TMDL which will in turn allow the Section to work on the permitting backlog. Additional staff is needed to assist in administering the CAFO program and issue CAFO permits and to further assist in reducing the permit backlog for NPDES permits. As of March 2012 over 400 CAFO NOIs have been submitted. DDA staff has also identified additional operations within the watershed that may qualify for CAFOs. As of March 2012 only one permit has been issued.

5.4 Strategy to Fill Gaps

For WWTPs, there are few modifications planned for existing regulatory programs concerning additional nutrient and sediment reductions. There are no plans to modify permitting strategies for WWTPs; however, there is a backlog that needs to be addressed to catch up statewide. At minimum two additional FTE and

funds are needed to complete this task. The permit renewal dates for the NPDES wastewater facilities in the Chesapeake Bay watershed can be found in Table 19.

The significant municipal facilities are currently permitted at 5.6-8 mg/L TN and 1.43-2 mg/l TP. The SWDS intends to reduce the permitted loads based on concentrations of 4.0 mg/L TN and 1.0 mg/L TP and the current design flows. Future increases in flow via growth will require facility upgrades which will present significant financial hardships for the affected communities without external financial assistance. The only non-significant municipal facility is Mobile Gardens MHP. Current permit limits for the facility are 13.2 mg/L TN and 1.8 mg/L TP. SWDS intends to maintain the permitted concentrations and resulting loads based on the current design flows. Future increases in flow will be addressed by maintaining current loads while tightening concentration limits. Mobile Gardens has rapid infiltration basins (RIBs) and uses a stream discharge as a back-up when needed.

For Invista, the significant industrial facility, the current permitted nitrogen load will be reduced by 60% during calendar year 2012 to achieve additional nutrient reductions when the NPDES permit is reissued. The permittee has scaled down operations at the plant based on market conditions and has invested in new equipment at the facility such as replacing the oversized wastewater treatment plant with a smaller package plant to more efficiently treat the resulting lower wastewater flows.

Compliance/participation rates for WWTPs do not need to be improved, as they are currently at satisfactory levels. For the SWDS to ensure timely permitting and eliminate backlogs, the industrial stormwater regulations are currently undergoing revisions and the Biosolids regulations are scheduled to begin the revision process in 2013. The Chesapeake Regulatory & Accountability grant provided by EPA is helping to fund these efforts.

Monitoring requirements have not been consistent at all facilities and that will be addressed during future permit revisions. For example, dissolved oxygen is monitored at Bridgeville (DO permit limits also), Laurel, Invista, and Mobile Gardens, but it is not required at Seaford. Nutrient species monitoring is also inconsistently required. Bridgeville's permit requires monitoring of Total Kjeldahl Nitrogen (TKN) and Ammonia Nitrogen, but no other nutrient species monitoring is required by any other permit. Industrial WWTP monitoring and reporting will be also required by permits in the future.

Table 19: NPDES Permit Expiration Dates

Facility	Expiration Date
Invista ¹	31 August 2011
Bridgeville ²	31 January 2012
Mobile Gardens	31 March 2013
Seaford	31 May 2013
Laurel	31 May 2014

¹ Permit has been Administratively extended.

² Permit has been Administratively extended.

5.5 Contingencies

If compliance rates with regulatory programs are not achieved, enforcement actions will be taken. If other sectors are not able to produce needed reductions, the Department may consider requiring the wastewater treatment plants to upgrade to better than ENR (Ecological Nutrient Removal) (3 mg/L; 0.3 mg/L TP) by 2025. Currently, DNREC does not believe this is necessary, as the municipal facilities have already upgraded to BNR (Biological Nutrient Removal) or equivalent and their permits will be modified to require 4 mg/L TN, and 1 mg/L TP). The current strategy accommodates for some growth, but will require additional improvements in the future, which will require securing funding first. There is a need for State and Federal funding resources to include grants to make upgrades to existing facilities affordable for the local communities. Progress will be assessed during milestone periods and will consider the need to make any adjustments in 2017.

5.6 Tracking and Reporting Protocols

The SWDS currently uses the Permit Control System to track wastewater facility permitted loads and is scheduled for transition to the Integrated Compliance Information System (ICIS) in early 2012. Therefore, the tracking and reporting system for wastewater facilities is transparent, accessible, and compatible with EPA decision support tools. Additionally, actual permitted values are reported monthly through DMRs.

5.7 NPDES Partnerships

The SWDS is working with several partners in an effort to ensure the permittees in the Chesapeake Bay Watershed are working towards a successful implementation of the Chesapeake Bay TMDL. The challenges associated with meeting the reduced waste load allocations will require everyone to work together and to utilize every resource available. At the Phase II point of the Chesapeake Bay WIP many partnerships have already been formed both internally within DNREC and outside between local government agencies and private citizens.

SWDS partnerships formed include but not limited to:

Internal to DNREC: Ground Water Discharges Section (See Section 6), Watershed Assessment Section, Financial Assistance Branch (See Section 15), and the Sediment and Stormwater Section (See Section 7).

External to DNREC: Town of Bridgeville, City of Seaford, Town of Laurel and Invista; Additional details about these local partners can be found in Section 8 of this WIP.

5.8 Sea Level Rise Considerations

According to DNREC's sea level rise scenarios, the properties on which the City of Seaford, Town of Laurel, and Invista wastewater treatment plants are situated are within an area that could be inundated by sea level rise up to 1.5 m (Figures 16-18). These facilities may wish to consider conducting a site-specific vulnerability assessment for storm flooding and sea level rise to better understand the potential impact of inundation to its shoreline, mechanical systems, buildings and pipelines and the impact those effects may have on local water quality. Adaptation measures that could be considered in the near term include flood-proofing the building to prevent water from entering the building or mechanical areas and shoreline protection. Longer term strategies might include raising the building and associated structures or moving

the facility to another location. The Bridgeville and Mobile Gardens wastewater facilities may not experience impacts from inundation, but should also be mindful of potential impacts to designated outfalls.

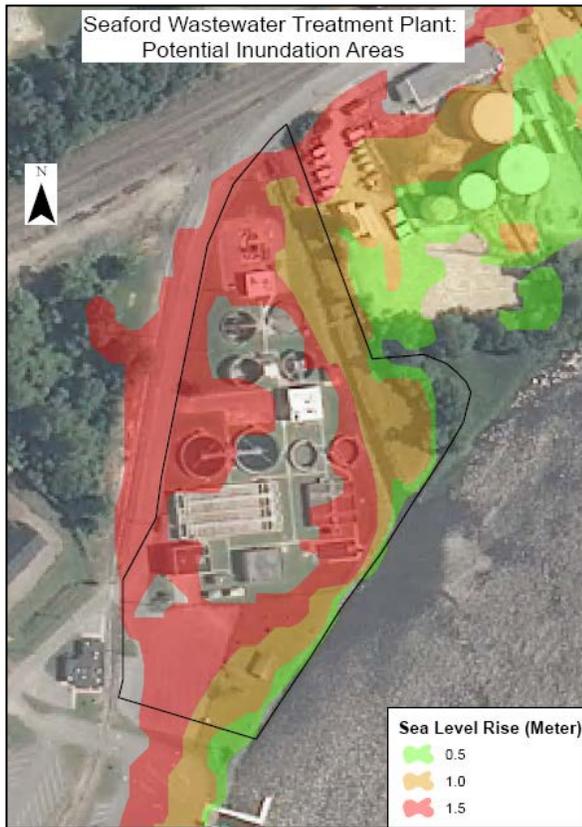


Figure 16: Potential Inundation at the Seaford Wastewater Treatment Facility

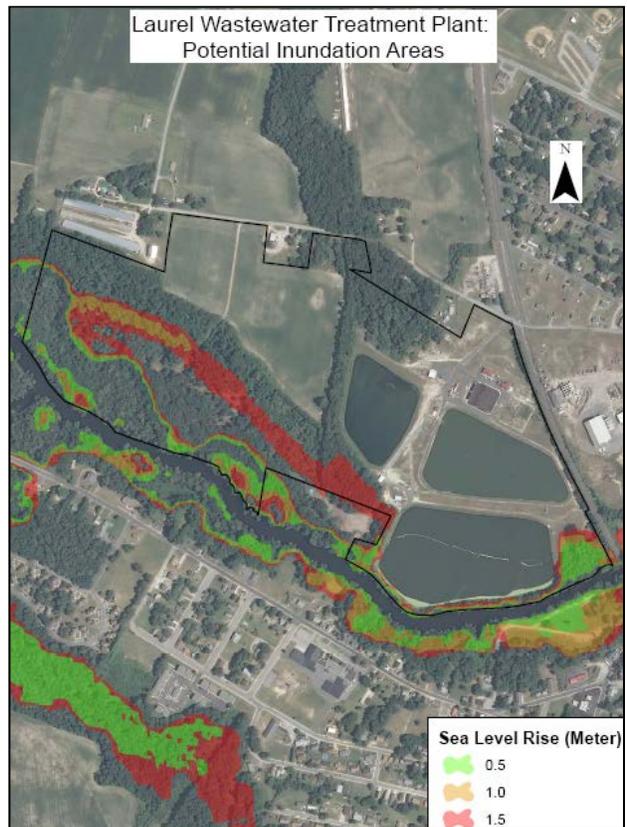


Figure 17: Potential Inundation at the Laurel Wastewater Treatment Facility

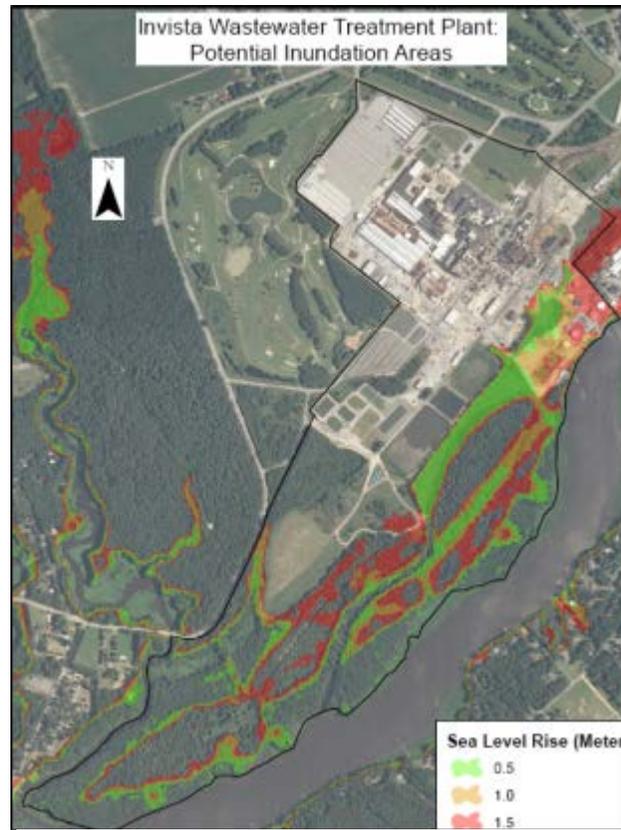


Figure 18: Potential Inundation at the Invista Wastewater Treatment Facility

5.9 Costs and Funding Sources

See Funding Section 15 for costs and funding sources.

5.10 Milestones

- 2012 - General NPDES Permit Program for Aquatic Pesticide applications (Section 5.1.1)
- 2012 – Invista permitted nitrogen load reduced by 60%. Permit has been administratively extended. (Section 5.4)
- 2012 – Revise and renew NPDES permit Bridgeville (Section 5.4)
- 2013 – Revise and renew NPDES permits Seaford and Mobile Gardens (Section 5.4)
- 2013 – Address Permit backlog through hiring seasonal or contractual employee.
- 2014 – Revise and renew NPDES permit for Laurel (Section 5.4)

SECTION 6. ON-SITE WASTEWATER

The On-site Wastewater Subcommittee assembled this section of the WIP. Members of the Onsite Wastewater Subcommittee were crossovers from the Wastewater Subcommittee. They have positions within DNREC, and come from the Ground Water Discharges Section. They have experience in site evaluation and permitting, construction permitting, operation and management of large, community, and municipal land based wastewater treatment and disposal systems, and non-hazardous liquid waste transporters.

For people living in either a small town, with neighbors a short walk away, or a rural area, with pastures as far as the eye can see, installing a septic system may be their only option for wastewater management. In order to obtain an individual residential on-site wastewater treatment and disposal system (OWTDS) in Delaware, three steps must be achieved. First, a site evaluation is performed by a DNREC licensed soil scientist to assign the appropriate system type and location. Once the owner receives the site evaluation, a licensed system designer can design an OWTDS and obtain the necessary construction permits. When all permits are in order, a licensed contractor will install the OWTDS. Under the Delaware Code, Title 7, [Chapter 60](#), site evaluations must be performed on unimproved lots before the sale of the lot.

6.1 Current Program and Capacity

6.1.1 DNREC Ground Water Discharges Section

The [Ground Water Discharges Section \(GWDS\)](#) is responsible for overseeing all aspects of the siting, design, and installation of onsite wastewater treatment and disposal systems (OWTDS, septic systems). The section also issues non-hazardous liquid waste transporter permits and licenses to percolation testers, designers, soil scientists, system contractors, liquid waste haulers, and system inspectors. The Ground Water Discharges Section is broken down into two branches; the Small Systems Branch, which has two offices (one in Dover, serving Kent and New Castle Counties and the other in Georgetown, serving Sussex County) and the Large Systems Branch in Dover (serving all three counties).

The Small Systems Branch reviews and approves site evaluations, permit applications, and conducts installation and compliance inspections of systems with daily flows equal to and less than 2,500 gallons per day (gpd). This is a three-step process that includes the site evaluation, the design/permit application, and the construction/installation of the system.

The Large Systems Branch reviews and approves spray irrigation wastewater systems and on-site wastewater treatment and disposal systems with daily flows greater than 2,500 gpd, Innovative/Alternative Technologies, Advanced Treatment Units, underground injection wells, and other means associated with land application of treated wastewater. Currently, these types of larger systems that treat businesses and multiple homes are not captured in the Chesapeake Bay watershed model; rather, all onsite is assumed to be individual standard systems. This has implications for Delaware as the level of treatment achievable by these larger systems exceeds the level of treatment provided by individual standard systems. Therefore, we believe that our onsite wastewater loads are likely less than those being modeled. The GWDS will work with the Chesapeake Bay Program to address this issue when model recalibration occurs prior to 2017.

In regard to the cumulative target loads for point and nonpoint sources of nitrogen, phosphorus, and sediment from on-site wastewater, Delaware is currently using information from Phase 5.3 of the watershed model. Delaware plans on creating a map for individual and large/community OWTDS.

Individual OWTDS are required by permit conditions to have the septic tank pumped out once every three years. Any OWTDS with a design flow of 2,500 gpd and above are required by the current [Regulations Governing the Design Installation and Operation of On-site Wastewater Treatment and Disposal Systems](#) to have a licensed operator to oversee operations of the OWTDS, and submit compliance reports with monitoring data on a routine basis as established in the operating permit. All OWTDS's with a design flow of 2,500 gpd or greater are issued individual operating permits with a maximum 5 year term. The On-Site Regulations are currently open for review and several modifications resulting in increased nutrient reduction are being proposed on a state-wide basis (See Section 6).

Penalties for noncompliance include but are not limited to: voluntary compliance agreements, verbal warning, manager's warning letter, non-compliance notifications, Notice of Violation (NOV), and Secretary Order, which could include fines.

For voluntary and/or incentive-based programs identified in the WIP as currently controlling nutrient and sediment loads, programs verify that controls are installed and maintained through Department inspections and monitoring data (effluent, ground water, and soils). Repercussions and penalties for false reporting or improper installation or maintenance of voluntary practices are Under chapter 60 DE code fines can be as high as \$10,000 a day.

6.2 Tracking and Reporting Protocols

Since 2007, the GWDS has been using a database called Environmental Navigator, which tracks all permitted on-site wastewater treatment and disposal systems. The system tracks licenses, service providers, site evaluations, permits, inspections, and violations. It has a GIS capability and DNREC upgrades it annually to include additional fields as required, and as resources are made available. Additionally, work is underway to extract information regarding onsite system BMPs into the National Environmental Information Exchange Network (NEIEN) schema so that data may be directly sent to the Chesapeake Bay Program through network nodes and receive credit in the model. A description of data generation and acquisition, assessment and oversight, and data validation and usability are provided in Delaware's Nonpoint Source Best Management Practice Implementation Data Quality Assurance Project Plan (Appendix C), which was recently updated in the spring of 2011. DNREC staff are also participating in the development of the Bay TMDL Tracking and Accountability System (BayTAS) Version 1.0 to track the TMDL waste load allocations and load allocations and Delaware's progress toward meeting those goals.

The GWDS issues permits for all onsite wastewater treatment and disposal systems. The types of systems permitted for small systems (systems less than or equal to 2,500 gallons per day) are determined by a soils based approach to determine the limiting zone. Types of systems that are permitted are shallow systems that include gravity, low pressure pipe, elevated sand mounds, Wisconsin at grade, peat systems and subsurface drip irrigation. The GWDS captures this information in our data base.

Our database also tracks the various advanced treatment and large systems. Statewide, there are currently 125 active Large OWTDSs, and 23 wastewater spray irrigation facilities operating in Delaware. The GWDS is in the process of mapping all large systems in Delaware by working with staff from the Office

of Information and Technology (OIT). All systems have been identified by GPS and the data are undergoing quality assurance and control protocols.

Table 20: Number of large on-site and spray systems throughout the state

Design Flow Rate (gpd)	Number of Large On-Site Systems	Number of Spray Systems
<2,500	34	0
2,500-20,000	60	1
20,000-99,999	26	9
100,000-200,000	2	2
200,000-300,000	2	4
300,000-400,000	0	0
400,000-500,000	0	0
500,000-600,000	1	2
>600,000	0	5
Total	125	23

Upon promulgation of the revisions to the On-Site regulations, all Large Systems in Delaware will be required to comply with the applicable flow based Performance Standard.

6.3 Gap Analysis

The Department in preparation of the TMDLs and Pollution Control Strategies over the past five years has increased staffing in the GWDS program by establishing two new full time positions. One position was an Environmental Scientist position to review and issue permits and to inspect advanced wastewater treatment and disposal systems statewide. The other position was a Senior Compliance Specialist to review and provide QA/QC for inspections made by Class H Licensees that inspect systems at the sale of a property. In order to improve compliance and increase participation rates by 20%, funding should be increased to provide greater outreach, staffing, and technical resources. Recently, three GWDS staff (full time equivalents, FTEs) left the Section and all of these positions need to be re-filled in order to not fall behind on workload and increase work levels to achieve new goals. The Department commitment to funding the onsite program has been further shown in these tight budget times by filling two of the vacant positions; one vacant position filled in September 2010 and the second position filled in January 2011. It is anticipated that the third position will be filled by FY13. The Section would be better served by increasing the staffing levels by one FTE (\$50K annually). Additional needs to fill gaps are identified below:

- Additional staff or staff movement will likely be needed to maintain a new aggressive operation and maintenance inspection program in addition to the current operation and maintenance program for the innovative and alternative system requirements, and data collection.
- Improved tracking and reporting of pump-outs and inspections, advanced treatment units, and connections to central sewer
 - Delaware's Environmental Navigator, a data management system, needs improvements. Additional funding for database upgrades and management (\$50K annual)

- Staff training in advanced treatment units for permitting, inspection, operation, and maintenance requirements. Training has been started and will be ongoing as the new technologies become available.
- Will need funds to update the database to track waste haulers and verify septic system pump out requirements are being met and expect to have grant funding to update the database.
- Will need to provide funds to update data base to incorporate GIS mapping, watershed boundaries, and document scanning.
- There is a need for State and Federal funding resources to include grants to make municipal systems affordable, to extend municipal sewer service areas to serve areas with high densities of septic systems, and to help low-income on-site users replace or repair failing systems and/or install nutrient reducing technologies
 - See [Community Financing for Septic Management in the Inland Bays Watershed](#) prepared by the Environmental Finance Center January 29, 2008.

6.4 Strategy to Fill Gaps

Regulatory Initiatives

To ensure that local water quality is maintained and/or local TMDLs are complied with in light of anticipated new or increased nutrient loads from additional OWTDSs, the GWDS has already begun the formal process of revising the current OWTDS regulations. The [revised regulations](#) will be published in the Delaware Register of Regulations on April 1, 2012 and a public hearing has been scheduled for May 3rd in the DNREC Auditorium. Pending public comments, the hearing officer's review and recommendation, and the decision of the DNREC Secretary, the final regulations are expected to be promulgated by the end of 2012. Delaware's draft Onsite regulations go above and beyond the recommendations identified in EPA's "National Guidelines for Management of Onsite and Clustered (Decentralized) Wastewater Treatment Systems."³ We have already implemented the "Five Management Models" listed in the EPA document and our design requirements and level of treatment requirements are more stringent than the EPA recommendations. The revised regulations include the following proposed actions:

Small Systems

Inspection and Pump-out Program

A statewide inspection and pump-out program will require properties served by on-site systems to be inspected by a Class H inspector and the septic tank pumped by a Class F liquid waste hauler prior to the transfer of a property. Unsatisfactory systems (including cesspools and seepage pits) identified upon inspection will be required to be repaired, replaced, or upgraded, depending on location and date (see N reducing systems within 1,000 feet of tidal waters and associated tidal wetlands below). The GWDS will be receiving inspection reports from licensees that will indicate the type of system and the condition of the system at the time of property transfer. This information will be placed into our database. For failing systems, the seller/buyer will be required to come into compliance. At this time the GWDS does not have any estimates of how many cesspools and seepage pits are in the Chesapeake Watershed. The GWDS will use the enforcement tools available to ensure these systems come into compliance. Currently, homeowners receive a [brochure](#) about their OWTDS.

GOAL: By 2025, pump out one third of systems within the Chesapeake each year. We anticipate to be at 60% of our goal by 2017. To insure these systems are pumped out, our proposed regulations require the

³ http://www.epa.gov/owm/septic/pubs/septic_guidelines.pdf

licensed pumper to submit the 911 address and gallons pumped to the GWDS so we can track the pumpouts. A database will be set up so the pumpers can either enter the data or submit a hard copy. Once in the database, the GWDS and the pumpers will be able to determine which properties have not been pumped and can contact the owners letting them know it is time to have their system pumped. This requirement will come into effect two years after promulgation of the Regulations giving time to educate property owners and the pumpers as well as time to set up this interactive database. Since the requirements will be just coming into place, we do not plan to set a 2013 milestone goal for pump-outs, although pump-outs will likely occur and we will track and report progress annually.

Advanced Treatment Upgrades for Existing Individual Systems

The GWDS has also proposed regulations that will require all septic systems within 1,000 feet of tidal waters and associated tidal wetlands in Delaware's Chesapeake drainage to be upgraded to advanced treatment technologies when new septic systems are installed or when failing systems must be replaced. The systems will achieve Delaware's Performance Standard Nitrogen level 3, which requires an average annual concentration of 20 mg/l total nitrogen in effluent sampled at the end-of-pipe of the pretreatment unit or a 50% reduction in effluent total nitrogen concentration when compared to the influent total nitrogen concentration. As part of our contingency plan, the GWDS may also require all other septic systems within the watershed to upgrade to advanced treatment at the time of failure by 2025.

Figure 19 shows the parcels located entirely within 1,000 feet of the Chesapeake Bay tidal waters and associated tidal wetland areas. Within the portion of the Chesapeake Bay in Delaware, there are two tidal areas, the Nanticoke River and the western portion of the Chesapeake and Delaware Canal. The parcels were classified to show if they currently have an on-site septic system, central sewer service, or neither, meaning that the parcel is currently undeveloped.

GOAL: Upgrade 1,432 systems within 1,000 feet of tidal waters and associated tidal wetlands to advanced treatment (septic denitrification) technologies. Since these systems will be required to upgrade only if and when they fail, it is difficult to determine timing. We are assuming that all will be upgraded by 2025, however if they are maintained properly, some existing systems may last longer. We are therefore not setting 2013 milestone and 2017 interim goals for upgrades.

Table 21: The 2025 goal of the number of systems within 1,000 feet of tidal waters and associated tidal wetlands to advanced treatment (septic denitrification) technologies

Land-River Segment	Upgrades by 2025
A10003EU0_3011_0000	1
A10005EL0_4632_0000	269
A10005EL0_4633_0000	266
A10005EL2_4630_0000	896

Operation and Maintenance of Innovative and Alternative Technologies

Owners of innovative and alternative (IA) technology systems will be required to have a contract with a licensed certified service provider that inspects the system twice a year and submits the inspection reports to the GWDS. If the system is found to be out of compliance, then the GWDS will take actions to have the owner bring the system back into compliance.

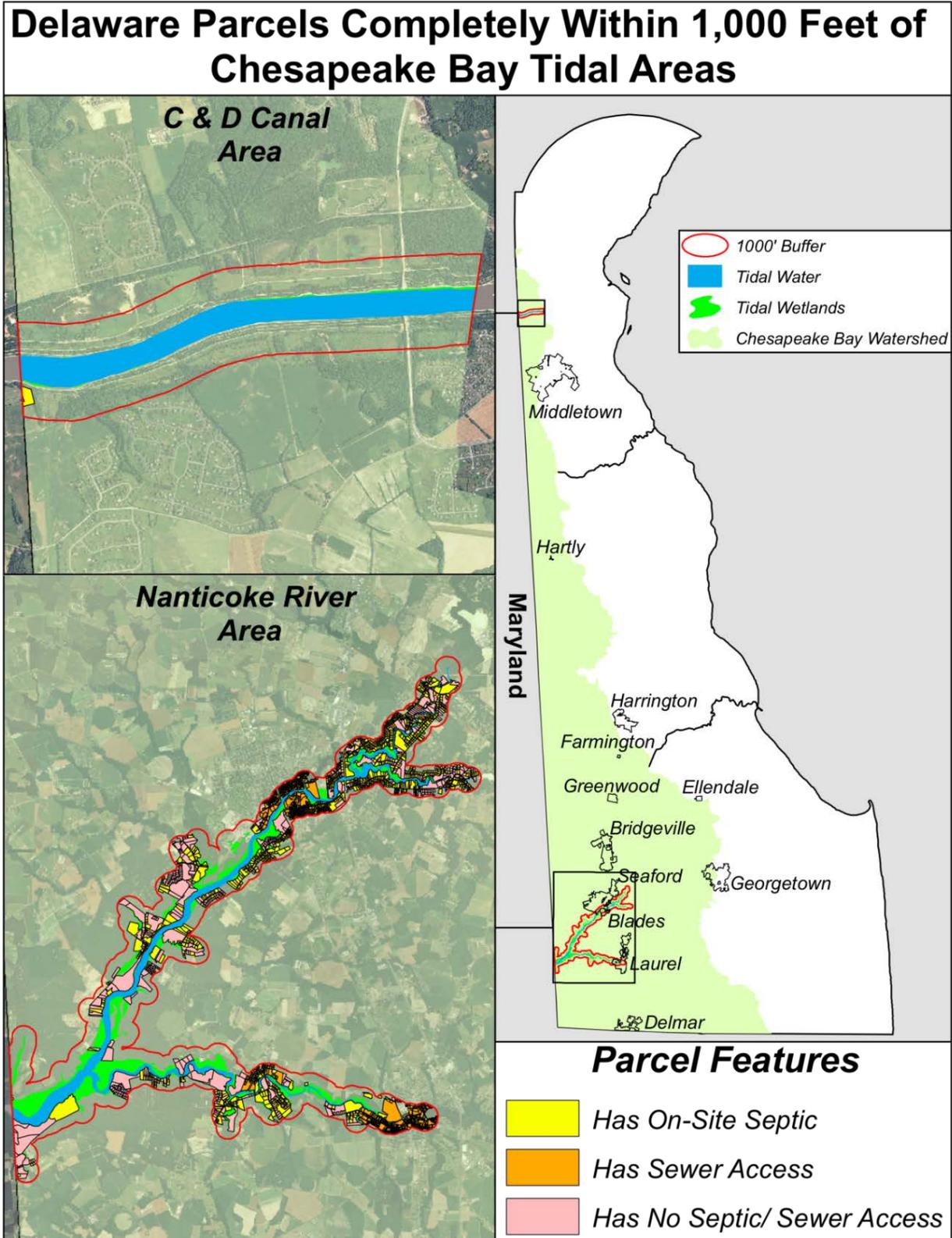


Figure 19: Parcels that will be required to upgrade to advanced treatment pending promulgation of future regulations.

Large Systems

DNREC is proposing as draft regulations in the April 2012 Delaware Register of Regulations stricter controls on large systems, as documented below:

- All Large OWTDSs within the State will be required to comply with the applicable Performance Standards below. Routine effluent sampling will be required to verify compliance with the Performance Standards. Additionally, spray irrigation facilities will be required to install lysimeters to document percolate concentrations. All Large OWTDSs and Spray Irrigation facilities are required to install monitoring wells to verify that the discharge from the facility is not causing a violation of any primary drinking water standard.
- Large OWTDS applications may include a Surface Water Assessment Report to verify compliance with applicable TMDL requirements
- All Large Systems are inspected on a routine basis. A comprehensive Annual Inspection is performed for all Systems. Systems with a design flow greater than or equal to 20,000 gpd are inspected on a quarterly basis. Inspection frequencies are increased if a facility is out of compliance. Penalties for non-compliance include but are not limited to: voluntary compliance agreements, verbal warning, manager's warning letter, non-compliance notifications, Notice of Violation (NOV), and Secretary Order, which could include fines.
- All systems with a design flow greater than 2500 gpd are required to have a licensed wastewater operator in Direct Responsible Charge of the wastewater treatment and disposal facility. The level of license required is based on the complexity of the wastewater treatment and disposal system, as documented in the [Regulations for Licensing Operators of Wastewater Facilities](#).
- All new or proposed Large systems serving 50 or more units must be owned and operated by a Public Utility approved by the Delaware Public Service Commission (PSC). The Utility must obtain a Certificate of Public Convenience and Necessity (CPCN) from the PSC before constructing any large system serving 50 or more units. The PSC oversees the financial stability of the Utility and approves sewer rates. New systems serving less than 50 units are required to establish an Escrow Account to ensure long term financial viability of the system.

The following is the [Proposed On-site Wastewater Performance Standard Definitions and Requirements that are proposed in our Draft Regulations](#).

Performance Standard Nitrogen level 1 (PSN1) means where total nitrogen levels achieve either:

- an average annual concentration of 5 mg/l (parts per million (ppm)) total nitrogen in effluent sampled at the end-of-pipe of the pretreatment unit; or
- a 90% reduction in the effluent total nitrogen concentration when compared to the influent total nitrogen concentration; or
- an average annual concentration of 10 mg/l beneath any permitted wastewater spray irrigation field as verified by monitoring in-field lysimeters, providing that the design percolate concentration does not exceed 10 mg/l on an average annual basis.
- Discharge limitations are to be expressed as a mass, based on average design flows (221 gallons per day per unit for residential systems).

Performance Standard Nitrogen level 2 (PSN2) means where total nitrogen levels achieve either:

- an average annual concentration of 10 mg/l (parts per million (ppm)) total nitrogen in effluent sampled at the end-of-pipe of the pretreatment unit; or

- an 80% reduction in effluent total nitrogen concentration when compared to the influent total nitrogen concentration; or
- an average annual concentration of 10 mg/l beneath any permitted wastewater spray irrigation field as verified by monitoring in-field lysimeters, providing that the design percolate concentration does not exceed 10 mg/l on an average annual basis.
- Discharge limitations are to be expressed as a mass, based on average design flows (221 gallons per day per unit for residential systems).

Performance Standard Nitrogen level 3 (PSN3) means where total nitrogen levels achieve either:

- an average annual concentration of 20 mg/l (parts per million (ppm)) total nitrogen in effluent sampled at the end-of-pipe of the pretreatment unit; or
- a 50% reduction in effluent total nitrogen concentration when compared to the influent total nitrogen concentration.

Performance Standard Phosphorus level 1 (PSP1) means where total phosphorus levels achieve either:

- an average annual concentration of 3.9 mg/l (parts per million (ppm)) total phosphorus in effluent sampled at the end-of-pipe of the pretreatment unit; or
- a 75% reduction in effluent total phosphorous concentration when compared to the influent total phosphorus; or
- an average annual concentration of 3.9 mg/l beneath any permitted wastewater spray irrigation field as verified by monitoring in-field lysimeters, providing that the design percolate concentration does not exceed 3.9 mg/l on an annual average basis.
- Discharge limitations are to be expressed as a mass, based on average design flows (221 gallons per day per unit for residential systems).

Performance Standard Phosphorus level 2 (PSP2) means where total phosphorus levels achieve either:

- an average annual concentration of 7.85 mg/l (parts per million (ppm)) total phosphorus in effluent sampled at the end-of-pipe of the pretreatment unit; or
- a 50% reduction in effluent total phosphorus concentration when compared to the influent total phosphorus concentration.
- Discharge limitations are to be expressed as a mass, based on average design flows (221 gallons per day per unit for residential systems).

Requirements for large OWTDSs having flows greater than 2,500 gpd but less than 20,000 gpd:

- All new systems shall meet a Performance Standard Nitrogen level 2 (PSN2).
- All replacement systems shall meet a Performance Standard Nitrogen level 3 (PSN3).
- When the operation and maintenance permit expires for an existing system, the system must meet a Performance Standard Nitrogen level 3 (PSN3). If the Department deems that the large OWTDS must be redesigned, the owner or operator of the system will have up to 60 months from the permit expiration date to bring the OWTDS into compliance with the new standard.
- Where the system location is identified as having high potential for phosphorus mobility, new OWTDSs shall meet a Performance Standard Phosphorus level 2 (PSP2).
- When the operation and maintenance permit expires for an existing system and the system location is identified as having high potential for phosphorus mobility, the system must comply with the Performance Standard Phosphorous level 2 (PSP2).

Requirements for large OWTDSs having flows greater than 20,000 gpd:

- All new systems shall meet Performance Standard Nitrogen level 1 (PSN1).
- All replacement systems shall meet Performance Standard Nitrogen level 2 (PSN2).
- When the operation and maintenance permit expires for an existing system, the Department will require the system to meet Performance Standard Nitrogen level 2 (PSN2). If the Department deems that the OWTDS must be redesigned to meet PSN2, the owner or operator of the system will have up to 60 months from the permit expiration date to bring the OWTDS into compliance with the new standard.
- Where the system location is identified as having high potential for phosphorus mobility, new OWTDSs shall meet a Performance Standard Phosphorus level 1 (PSP1).
- When the operation and maintenance permit expires for an existing system, and the system location is identified as having high potential for phosphorus mobility, the system must comply with the Performance Standard Phosphorous level 1 (PSP1). If the Department deems that the system must be redesigned to meet PSP1, the owner or operator of the system will have up to 60 months from the permit expiration date to bring the OWTDS into compliance with the new standard.

Additionally, the Department has proposed a new performance standard to apply to any OWTDS that uses Rapid Infiltration Basins (RIBs) as a disposal method. For these systems, the Department proposed that the effluent meet at the end of the pipe of the pretreatment unit Total Nitrogen concentrations of 4.0 mg/L and Total Phosphorus concentrations of 0.5 mg/L, for systems with flows greater than 300,000 gpd; 5.0 mg/L TN and 3.8 mg/L TP for systems with flows between 20,000 – 299,999 gpd; and 10 mg/L TN and 7.8 mg/L TP for systems with flows between 2,500 – 19,999 gpd. These standards are under debate and will be carefully considered prior to promulgation of the final regulations.

Finally, the draft onsite regulations propose all new spray irrigation facilities to achieve 10 mg/L TN and 2 mg/L TP at the lysimeter.

It should be noted that requiring upgrades when operation and maintenance permits expire for existing systems may cause a hardship for systems that are owned by Homeowners Associations. The Department will work with them through our Financial Assistance Branch for low interest loans.

Other Non-Regulatory Initiatives

Septic Connections

Through expanding sewer districts, onsite septic systems will be eliminated in the future. Local short term (2013 and 2017) and long term (2025) sewer annexation plans were reviewed and existing onsite systems that will fall within these expanding districts were identified.

GOAL: Eliminate a minimum of 477 systems (reported as equivalent dwelling units (EDUs)) by 2013, 4,430 by 2017 and 6,295 across the Chesapeake Drainage in Delaware by 2025. This number may be increased pending review of the information discussed above in Accounting for Growth.

Table 22: Septic connections through 2025 (equivalent dwelling units)

Land-River Segment	Connections by 2013	Connections by 2017	Connections by 2025
A10001EL2_4400_4590		18	18
A10001EM2_3980_0001	356	356	356
A10001EU2_3520_0001		90	90
A10003EU0_3201_0000		54	60
A10003EU0_3361_0000		0	108
A10003EU2_3520_0001		0	186
A10005EL0_4560_4562		404	404
A10005EL0_4561_4562		36	36
A10005EL0_4562_0001		94	94
A10005EL0_4631_0000		92	92
A10005EL0_4632_0000		602	674
A10005EL0_4633_0000	121	910	916
A10005EL0_5400_0001		70	70
A10005EL2_4590_0001		1	1
A10005EL2_4630_0000		1703	3190

Repairs and Replacements

An initiative that improves water quality and protects the health of streams and rivers in Sussex County by reducing the number of failing septic systems in the Chesapeake Bay and Inland Bays Watersheds is underway. The initiative will replace 100 failing septic systems in 2012 by identifying and securing qualified loan applicants for the Delaware Clean Water State Revolving Fund's Septic Rehabilitation Loan program and the Septic Extended Funding Option program. This initiative will use the services of First State Community Action, a non-profit grassroots organization with a proven ability to access the needs of homeowners in low-to-moderate communities.

6.5 Contingencies

If compliance rates with regulatory programs are not achieved, the contingency plan is to take enforcement actions. Additionally, as mentioned under 6.1.4 above, the GWDS may amend the Regulations to require all new and replacement systems, not just within 1,000 feet of tidal waters and associated tidal wetlands, to upgrade to advanced treatment. As part of the contingency plan DNREC will review the recommendations of the white paper prepared by the Environmental Finance Center "[Community Financing for Septic System Management in the Inland Bays Watershed.](#)" The paper shows how other states have tried to address the issue of funding and affordability by using personal income tax credit programs for septic repair, replacement, and sewer connection (MA); community septic management lending program (MA); responsible management entity concept and application of a septic utility fee (case study NC); and general septic fee (MD). The Department will also be using existing funding sources including the State Revolving Loan Fund (SRF) Septic Rehabilitation Loan Program, Community Development Block Grant (CDBG), and the USDA 504 Housing Rehabilitation Loan Program.

6.6 Onsite Partnerships

The GWDS is working with several partners in an effort to ensure the permittees in the Chesapeake Bay Watershed are working towards a successful implementation of the Chesapeake Bay TMDL. The challenges associated with meeting the reduced load allocations will require everyone to work together and to utilize every resource available. At the Phase II point of the Chesapeake Bay WIP many partnerships have already been formed both internally within DNREC and outside between local government agencies and private citizens.

GWDS partnerships formed include but not limited to:

Internal to DNREC: Surface Water Discharges Section (See Section 7), Watershed Assessment Section, Financial Assistance Branch (See Section 15), and the Sediment and Stormwater Section (See Section 7).

External to DNREC: Delaware Onsite Wastewater Recycling Association (DOWRA), licensees, Southeast Rural Community Assistance Project, Inc., First State Community Action

6.7 Sea Level Rise Considerations

As sea level rise increases, existing homes that are still served by septic systems may be impacted if groundwater levels also rise (the potential relationships between sea level rise and groundwater are poorly understood right now). Since onsite wastewater treatment relies on disposal, and in many cases additional treatment through the soils, to the groundwater, some systems may lose the ability to drain and their pollutant removal efficiency could be diminished. If this happens, ground and surface water quality may also be negatively impacted. Table 23 below shows the number of existing septic systems that fall within the 0.5, 1.0, and 1.5 meter scenarios.

Table 23: Existing Onsite Systems within Potential Sea Level Rise Inundation Areas

	0.5 Meter Scenario	1.0 Meter Scenario	1.5 Meter Scenario
Number of Systems	48	84	130

The GWDS has proposed adding the language below to the onsite regulations to address sea level rise concerns:

"2.22 FEMA guidelines must be adhered to when siting OWTDS's in flood prone areas designated as "V" zones prior to permitting."

The Onsite Regulations have also proposed requiring advanced treatment for new and replacement systems within 1,000 feet of tidal waters and tidal wetlands to reduce the level of nutrients reaching ground and surface waters. In the future, onsite systems in these areas may be even closer to water with few opportunities for nutrient retention. Onsite systems usually have a life span of approximately 20 years and the areas potentially impacted by rising sea level may not see effects until much further into the future. Communities in these areas may want to consider long term options such as eventual conversion to central sewer since systems may not continue to properly function with a higher water table.

SECTION 7. URBAN/SUBURBAN STORMWATER

Rainfall events are key in the natural hydrologic cycle. However, in highly developed areas with greater impervious cover, rainfall results in flooding, erosion, and contamination. As the water moves over these impervious surfaces, such as rooftops, driveways, roads, and parking lots, it picks up pollutants such as fertilizers containing excess amounts of nitrogen and phosphorus, sediment, oil from parking lots, trash, and other potentially harmful contaminants.

To meet TMDL standards for water quality, Delaware follows strict stormwater mandates requiring Best Management Practices (BMPs) to be used that will minimize the impact of stormwater runoff rates and volumes, prevent erosion, and capture pollutants. Green Technology BMPs, developed in the late-1990s, have proven to be extremely effective in maintaining high water quality, while also addressing water quantity. This technology intercepts stormwater runoff and directs it to vegetated areas in order to mimic natural hydrology. The vegetated areas first filter many of the pollutants from the water. Depending on the practice chosen, many also have the ability to infiltrate and recharge stormwater runoff to further reduce pollutant loads. Some of the green technologies that Delaware installs, mandated through the Delaware Sediment and Stormwater Program, include bioretention, buffers, conservation site design, filter strips, source area disconnection, biofiltration swales, and infiltration trenches.

The Stormwater Subcommittee gathered members from DNREC, DelDOT, and DDA to combine their expertise and apply it to this section of the WIP. This subcommittee represented the state regulatory permitting authority for MS4s, MS4 permittees within the Chesapeake Bay Watershed, the state permitting authority for construction, post construction, industrial stormwater activities, agency watershed managers and planners, and the state department of transportation, strictly relating to stormwater. The members have experience in NPDES permit coverage for individual stormwater sites and MS4s, engineered sediment and stormwater plans for State and Federal facilities, Delaware Sediment and Stormwater Regulations (DSSR), green technology BMPs relating to stormwater, drainage relief management, and other watershed-related areas of expertise.

From the 2007 land use and land cover data from Delaware's Office of State Planning Coordination, it was discovered that developed lands within the Chesapeake, where urban and suburban stormwater runoff originates, make up about 10% of the overall landscape. Most of the area is considered low density residential (81%). The remaining areas are commercial (5%), high density residential (5%), industrial (3%), open space (2%), roads (2%), and institutional (1%). Within the Delaware portion of the Chesapeake drainage, only about 4% is covered by impervious surfaces. Roads make up 33% of that area (Figure 20).

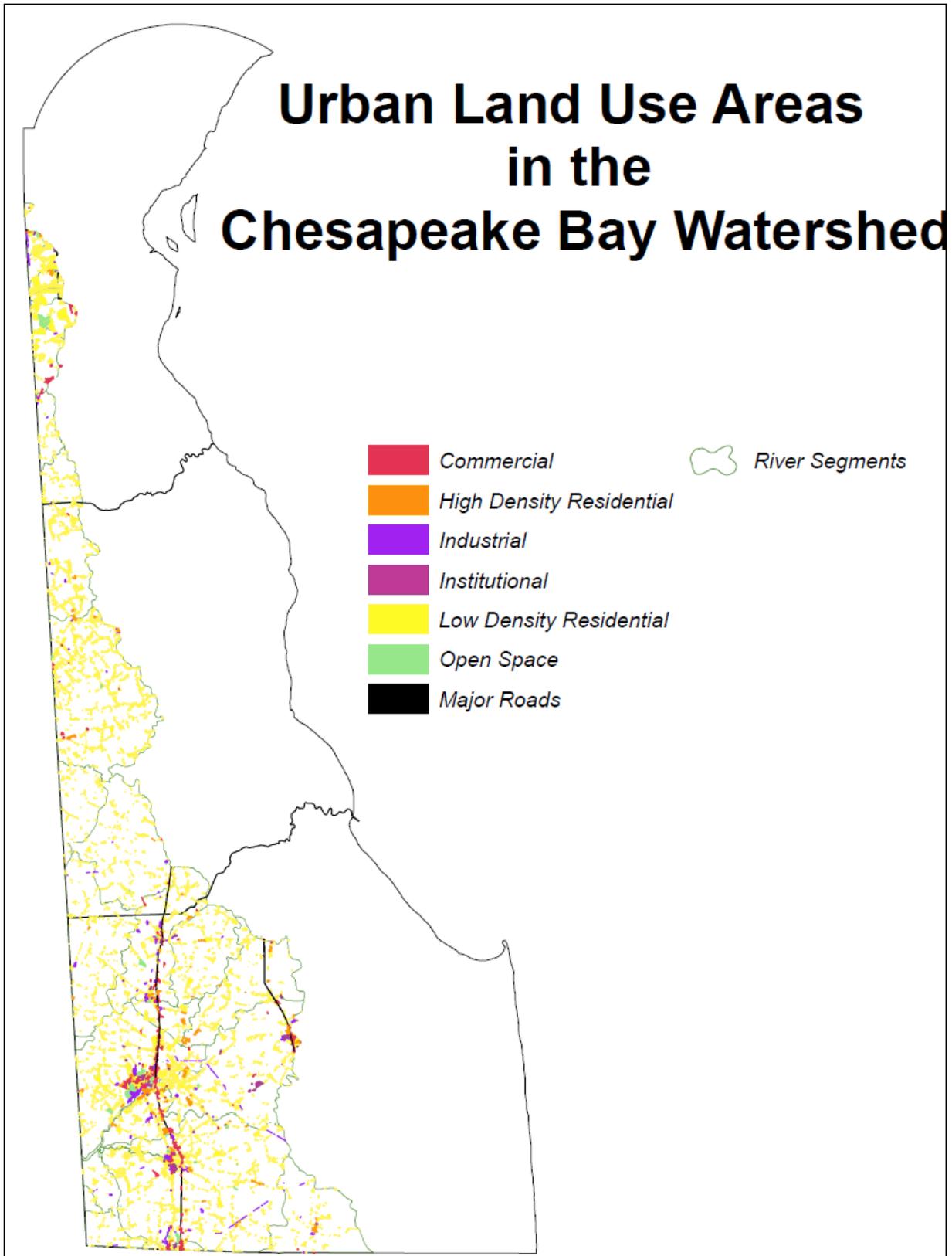


Figure 20: Urban Land Use Areas in Delaware's Chesapeake

7.1 Stormwater Partners

Several programs within Delaware address stormwater from urban and suburban lands. An overview of each program is provided below along with a discussion of their current capacity, tracking and reporting protocols, gaps, strategies to fill gaps, and contingencies.

7.1.1 Sediment and Stormwater Program

7.1.1.1 Overview and Current Capacity

The [Sediment and Stormwater Program](#) is currently managed by the Division of Watershed Stewardship in the Department of Natural Resources and Environmental Control. The Delaware Sediment & Stormwater Regulations (DSSR) require erosion and sediment control during construction and post-construction stormwater quantity and stormwater quality control. The DSSR effectively cover the entire development process, from the time construction begins, through project completion, and permanent maintenance of stormwater management facilities. Unless specifically exempted, any proposed land development project that disturbs more than 5,000 square feet must comply with the DSSR. The DSSR are effective State-wide, and are applicable for new development, redevelopment, MS4s and non-MS4s. In order to comply with these regulations, projects must employ stormwater Best Management Practices (BMPs) to address both water quality as well as water quantity impacts. The Sediment & Stormwater Management Plans are vigorously reviewed by local delegated agencies and are only approved if it is deemed that they meet minimum State-wide regulatory requirements. These delegated agencies also ensure these approved plans are constructed properly in the field through a process of frequent inspections on a regular basis that ensures regulatory compliance with the DSSR that includes a final inspection and close-out process. The penalty section of the DSSR provides DNREC with the authority to pursue both civil and criminal actions should enforcement for non-compliance be necessary.

The program's initial emphasis is to prevent existing flooding or water quality from worsening and limit further degradation until more comprehensive, watershed approaches (as detailed in State legislation and regulations) are adopted. Section 10.3.5.1 of the DSSR requires practices collectively referred to as Green Technology BMPs to be given first consideration in the management of stormwater quality on a site. Green Technology BMPs include bioretention, buffers, conservation site design, filter strips, source area disconnection, biofiltration swales, and infiltration trenches. These BMPs use filtering in vegetative areas as well as infiltration and recharge in order to mimic natural hydrology. This approach extracts a relatively high concentration of pollutants from the water, depending on the practice chosen. The resulting cleaner water can then enter into a waterway or soak into the ground to recharge underground water sources. Current regulations require stormwater management practices to achieve an 80% reduction in total suspended solids loads after a site has been developed. This is achievable with present technology. Long-term removal rates of over 80% may require other measures, such as water reuse, which could be required locally.

Impaired waters, including watersheds having established TMDLs, are subject to heightened requirements under the DSSR Section 10.3.5.4. Permanent stormwater management BMPs, again with preference given to Green Technology BMPs, are designed for individual sites to meet the TMDL pollutant reduction target. A treatment train approach, multiple BMPs in series, is often required to meet the target.

In Delaware, day-to-day implementation responsibilities are handled by the local Delegated Agency, made up of specified municipalities, counties, and conservation districts. In addition, the Delaware Dept. of Transportation (DelDOT) has been given delegation for program elements related to their in-house transportation related projects. Delegation responsibilities include plan review and approval, construction review, and maintenance inspections of existing stormwater management facilities. It is important to coordinate with Delegated Agencies as they can work with Homeowners Associations on stormwater system maintenance education and outreach and compliance. Projects having site compliance issues or problems relating to site design or erosion and sediment control is handled by the State, along with all state and federal facilities. The state additionally has progressive and enforcement options available, including civil and criminal penalty provisions that can aid in regulatory compliance. A list of the current Delegated Agencies and their areas of responsibility is included below:

State Agencies

[Department of Natural Resources & Environmental Control](#)

Division of Watershed Stewardship
Sediment and Stormwater Program
89 Kings Highway
Dover DE 19901
Phone: (302) 739-9921
Fax: (302) 739-6724

Responsible for all aspects of administration of the state sediment and stormwater management program under the Delaware Sediment and Stormwater Law and Regulations. Responsible for plan review and inspection of State and Federal Projects.

[Department of Transportation](#)

800 Bay Road
P.O. Box 778
Dover DE 19903
Phone: (302) 760-2251
Fax: (302) 739-6360
Delegated Area: DelDOT Construction

New Castle County

[New Castle County Dept. of Land Use](#)

Licensing Division
87 Reads Way
Corporate Commons
New Castle DE 19720
Phone: (302) 395-5400
Fax: (302) 395-5488
Delegated Area: All unincorporated areas of New Castle County

[New Castle Conservation District](#)

2430 Old County Road
Newark DE 19702

Phone: (302) 832-3100, Ext. 3

Fax: (302) 834-0783

Delegated Area: All incorporated areas of New Castle County (except City of Newark and Town of Middletown).

[City of Newark](#)

Public Works Department

220 Elkton Road

Newark DE 19711

Phone: (302) 366-7040

(302) 366-7045

Fax: (302) 366-7160

Delegated Area: City of Newark

[Town of Middletown](#)

19 West Green Street

Middletown DE 19709

Phone: (302) 378-9120

Fax: (302) 378-1167

Delegated Area: Town of Middletown

Kent County

[Kent Conservation District](#)

800 Bay Road, Suite 2

Dover, DE 19901

Phone: (302) 741-2600 (X 3)

Fax: (302) 741-0347

Delegated Area: Kent County

Sussex County

[Sussex Conservation District](#)

23818 Shortly Road

Georgetown DE 19947

Phone: (302) 856-7219

Fax: (302) 856-0951

Delegated Area: Sussex County

The Sediment and Stormwater [Regulations](#) are currently being [updated](#). The additional controls that will result in increased reductions of nutrient and sediment loads due to the proposed revised regulations are summarized in Section 7.1.1.4 below.

The requirement to have an approved Sediment & Stormwater Plan prior to the start of any regulated land disturbing activity greater than 5,000 sq. ft. has been a requirement since the Delaware Sediment & Stormwater Regulations were originally promulgated in 1991. For construction sites that fall under these

regulations, 100% are permitted through the NPDES Construction General Permit (CGP). The DSSR also contain a provision for training private individuals to serve as Certified Construction Reviewers to augment the local agencies' resources for performing construction site reviews on a weekly basis. Coupled with the oversight reviews by the local agencies, this assures each active construction site is checked for compliance on a regular basis. If deficiencies are found at a site, these are noted on an inspection form and a time frame is given for correction. If the issues are not corrected, it could result in a Notice of Violation (NOV). Penalties for noncompliance under the Delaware Sediment and Stormwater Program include state enforcement, including civil and criminal penalties, as well as administrative penalties at the state level.

7.1.1.2 Tracking and Reporting Protocols

For new development, the collection, reporting, and verification of stormwater nutrient and sediment controls is the responsibility of delegated agency, with oversight by the DNREC Sediment and Stormwater Program. Currently, not all of the delegated agencies use the same tracking and reporting system, so information is not in a consistent format. However, the delegated agencies have been following a systematic process to gather the necessary data for modeling BMP impacts. Changes to existing collection, reporting, and verification procedures are already underway and will be complete statewide within the next couple years. A new database, MudTracker, will resolve this issue for several of the jurisdictions as it tracks post-development stormwater BMPs.

DNREC and DelDOT are currently working with the EPA to ensure that the reporting of this data is consistent with EPA schema protocols and that the reporting of progress only includes practices and programs that follow EPA-approved definitions of BMPs used in Scenario Builder and the Chesapeake Bay Program Watershed Model Phase 5.3. The state has also requested technical assistance from the EPA contractor Tetra Tech to explore alternative criteria to address scale issues and credit for load reduction stormwater BMPs. Since the major jurisdictions within the Chesapeake will be using MudTracker and the schema protocols are being incorporated, concerns for double-counting have now been minimized. Delaware will continue to work with EPA to gain guidance on certain questions such as whether practices, such as stream restoration, are considered to be a wetland restoration or a stormwater management measure.

Regulatory requirements include design standards, along with routine inspections for new development and re-development. If a stormwater BMP that was installed under the existing (and eventually the revised) regulations is deemed to be non-functional, the BMP must be reconstructed to a functional condition. Therefore the data contained in the database and reported to the Chesapeake Bay Program will only represent fully functioning practices and Delaware has procedures for ensuring that practices are in compliance.

Additionally, work is underway to extract information regarding stormwater BMPs from both MudTracker and DelDOT databases, representing more than 90% of the Chesapeake Bay Watershed in Delaware, into the National Environmental Information System (NEIEN) schema so that data may be directly sent to the Chesapeake Bay Program through network nodes and receive credit in the model. A description of data generation and acquisition, assessment and oversight, and data validation and usability will be provided in Delaware's Nonpoint Source Best Management Practice Implementation Data Quality Assurance Project Plan (Appendix C), which was recently updated in the spring of 2011. DNREC staff are also participating in

the development of the Bay TMDL Accounting and Tracking System (BayTAS) Version 1.0 to track the TMDL waste load allocations and load allocations and Delaware's progress toward meeting those goals.

In accordance with the DSSR Section 12, construction reviews are conducted weekly by certified construction reviewers (CCR) on projects where soil disturbance is greater than 50 acres. In addition, the Department or the delegated agencies may require a CCR on any project regardless of its size.

Each delegated agency may follow its own CCR policy approved by DNREC. The delegated agencies conduct inspections on a regular basis and use the CCR reports as a tool to help target their inspections. The Sediment and Stormwater Program meets with the delegated agencies monthly to discuss program issues. The Sediment and Stormwater Program is audited by EPA through the State Review Framework process.

7.1.1.3 Gap Analysis

In order to achieve enhanced water quantity and water quality goals, the Sediment and Stormwater Program has identified the need to revise the existing regulations that govern stormwater runoff from urban and suburban lands. These proposed regulations, which are discussed in more detail in the next section, are expected to be promulgated in 2012, and will apply to new development and redevelopment projects. These regulations will emphasize green technologies, which are expected to be adequate for minimizing new stormwater loads in the urban/suburban sector. Additionally, the permitting and compliance processes will be further enhanced.

One of the primary purposes of a gap analysis is to identify shortfalls in attainment of program goals so that a strategy can be developed to address those shortfalls. In order to finalize a gap analysis for the urban stormwater sector, it will be necessary to ensure any systematic errors in the Phase 5 model have been minimized. Potential sources of errors include:

- Land use classification data for the urban sector
- Urban stormwater BMP data
- Stormwater runoff estimates for the urban sector

Initial analysis of the latest Input Deck runs indicated discrepancies in all three of these areas when compared to local sources, as was noted in the Phase I WIP. For example, the urban land area used in the model was significantly less than the Delaware State Planning Office's 2007 LULC GIS data indicates. The acres of urban lands managed by stormwater BMPs were also known to be under-counted in the model. In addition, the pollutant loading calculated by the model for the urban sector appeared to be significantly higher than would be expected for the inputs used. The net effect of these apparent discrepancies leads to uncertainty in the modeling results. Improved landuse data collection methods in the latest model appear to be closer to local landuse data. In addition, the State has provided updated stormwater BMP data to be input into the most recent model runs. As a result, the pollutant loadings attributed to urban sources in the Chesapeake are getting closer to those expected based on local data, although some discrepancies still exist. The State will continue to coordinate with EPA and Chesapeake Bay Program modelers to ensure the most accurate data is used in the Phase 5 model in future runs in order to validate the results of any gap analyses.

7.1.1.4 Strategy to Fill Gaps

Regulations

In order to achieve additional nutrient and sediment reductions, the existing DSSR are in the process of being revised and updated. The proposed revised regulations were published in the February 1, 2012 Delaware Register of Regulations and a public hearing was held on March 1, 2012. The public comment period will remain open through March 30, 2012. Pending public comments, the hearing officer's review and recommendation, and the decision of the DNREC Secretary, the final regulations are expected to be promulgated by the end of 2012 and will go into effect after a minimum 90 day period. The Department will use the interim period between the promulgation date and effective date for education and outreach efforts to train the various Delegated Agency staff and regulated community. The revised regulations will apply to new development and redevelopment projects and will include requirements for both construction site and post-construction stormwater management state-wide. A technical document containing technical standards for new development and re-development projects will be developed in conjunction with the proposed revisions to the DSSR.

The emphasis under the proposed revisions for both stormwater quality and stormwater quantity management will be on runoff reduction techniques that encourage infiltration and recharge of stormwater runoff. This method will both decrease pollutant loads and mitigate the hydrologic impacts to receiving waters often associated with land development. All new projects developed State-wide under the revised Sediment and Stormwater Regulations will be required to reduce their annual stormwater runoff from all storms up to the 99th percentile precipitation and resultant pollutant loads to an equivalent "0% Effective Imperviousness." Redevelopment projects would be required to reduce their annual stormwater runoff and resultant pollutant loads to an equivalent of "50% of the existing Effective Imperviousness." This will, in essence, act as a surrogate for more costly urban retrofits. Projects that cannot meet the minimum runoff reduction target will be required to provide an offset. Stormwater treatment practices that further reduce pollutant loads may be employed to defray offset requirements in cases where runoff reduction is determined to be infeasible.

New effluent limitations set by EPA for construction activities will be incorporated into the next set of state construction general permit regulations. As of the date that this document was prepared, EPA has rescinded the proposed numeric effluent limits under the Construction General Permit (CGP) pending further review and analysis. If a new rule is proposed prior to the issuance of the updated CGP for Delaware, those requirements will be included.

Retrofits

The DSSR were promulgated in 1991 and included a water quality requirement to reduce annual TSS loadings from all new development by 80%. While nutrient load reductions were not specifically required under these regulations, the stormwater BMPs that were implemented to meet this requirement nonetheless also have some capability to reduce TN and TP loads. Therefore, all new development that occurred in Delaware's portion of the Chesapeake drainage since 1991 has been managed by post-construction stormwater BMPs. These typically included wet ponds, constructed wetlands and other stormwater treatment practices common in other jurisdictions around the Bay during that time period.

The DNREC Sediment & Stormwater Program uses the Delaware Office of State Planning's 1992 Land Use/Land Cover GIS layer as a baseline for determining lands that pre-dated the DSSR. Lands which fall into any of the urban classifications in the 1992 LULC coverage therefore reflect the "legacy" urban

stormwater pollutant sources in the Chesapeake drainage. Delaware's contribution to the total drainage to the Chesapeake Bay is approximately 1.1%. Based on an analysis of the 1992 LULC data, the "legacy" urban stormwater sources represent approximately 6% of the Delaware portion of the Chesapeake drainage (0.06% of the total Chesapeake drainage). Further analysis indicates that 77% of this "legacy" urban stormwater load is in low density residential development. Typical pollutant loads from this land use class are relatively low and in many cases may already meet baseline conditions. The remaining non-single family land uses therefore best represent the portion of the "legacy" urban stormwater load that could ostensibly be considered for stormwater retrofits. It would be impractical to assume that this entire "legacy" source could be retrofit with stormwater practices. Assuming an aggressive 25% goal would require approximately 1,500 acres of existing urban lands to be retrofit with stormwater practices. However, it must be noted that this would only account for 0.06% of the Delaware portion of the Chesapeake drainage (0.00004% of the total Chesapeake drainage).

The DNREC Sediment & Stormwater Program has further analyzed the cost effectiveness of performing stormwater retrofits for this "legacy" urban stormwater source. In its *Urban Subwatershed Restoration Manual Series, Manual 3, "Urban Stormwater Retrofit Practices"*, the Center for Watershed Protection found that urban stormwater retrofit costs are 1.5 to 4 times greater than the cost of constructing those practices for new development based on data collected from nearly 100 retrofit projects in a 2006 survey. Costs for wet pond retrofits ranged from \$1,350 to \$107,000 per impervious acre treated. Bioretention retrofit costs ranged from \$2,000 to \$327,000 per impervious acre treated. Design and engineering costs for these projects ranged from 32-40% of base construction costs. The authors further emphasize that other hidden costs to performing urban stormwater retrofits include programmatic costs to find, assess and rank potential retrofit projects.

The Center for Watershed Protection estimates the median cost of a bioretention retrofit project to be \$10.50/cu.ft. of runoff treated. A retrofit bioretention facility sized in accordance with Delaware's proposed design criteria to meet the Chesapeake Bay TMDL requirements for TN and TP would cost \$93,765 to treat one (1) acre of impervious area using the Center for Watershed Protection's cost estimate and reduce pollutant loads by 11.8 lbs/ac/yr for TN and 1.71 lbs/ac/yr for TP. Based on these figures, a 25% retrofit goal of 1,500 acres would reduce TN loads by 17,700 lbs/ac/yr and TP loads by 2,565 lbs/ac/yr at a cost of over \$140M. These facilities have a typical estimated lifespan of 20 years.

For comparison purposes, DNREC's Watershed Assessment Section has estimated that 1 acre of cover crop reduces N loads by 12.4 lbs/ac/yr in Delaware's Inland Bays watershed, which is approximately the same as the treatment capability of a bioretention facility for 1 acre of impervious area. However, the estimated annual cost for this BMP is only \$90/ac. Assuming the estimated stormwater retrofit costs could be used to subsidize the cost of planting additional cover crop in Delaware's Chesapeake Bay drainage, \$140M would provide 77,777 acres of cover crop each year for 20 years. This would provide N load reductions of 964,435 lb/ac/yr. This is more than 50 times the N load reduction that could be achieved using stormwater retrofits.

The analysis reveals that the "legacy" stormwater source is a very small percentage of Delaware's overall pollutant loadings to the Chesapeake Bay. Because of this, any pollutant reductions that could be achieved through urban stormwater retrofits would result in minimal gain at very high cost. The benefit/cost ratio for implementing additional agricultural BMPs far exceeds that for implementing stormwater retrofits to get similar pollutant load reductions. Rather than setting retrofit acreage goals based on a broad "shotgun" approach for this widely scattered "legacy" source, Delaware proposes targeting the major urban areas of

Seaford and Laurel for a more focused source control effort along with an opportunistic approach to stormwater retrofits as potential projects arise and funds become available. These two municipalities are both located in watershed segments that have been identified as being most “effective” for nutrient reductions. In addition, they both have direct stormwater discharges to waters within the Nanticoke watershed. The overall goal would be to seek funding opportunities for 5 acres in retrofits targeted specifically at the direct discharges from these two municipalities during the 2013 milestone period. It is anticipated that the Division of Watershed Stewardship would be the lead agency coordinating these efforts, with cooperation from select programs within the Division of Water and planning staff from the Office of the Secretary.

An outreach effort to garner interest in these efforts has already begun for Seaford and Laurel, as well as other municipalities in the Chesapeake Bay watershed. DNREC hosted a Center for Watershed Protection webinar on urban BMPs in July 2011 which was attended by staff from several Chesapeake municipalities. In addition a two-day stormwater retrofit workshop was hosted by the Division of Watershed Stewardship with assistance by the Center for Watershed Protection in the summer of 2011, for municipalities and non-profit organizations working within the Chesapeake to learn about retrofit strategies and techniques. Participants represented the Town of Bridgeville, City of Middletown, City of Newark, Kent Conservation District, Sussex Conservation District, Delaware Nature Society, Delaware Center of Horticulture, City of Dover Watershed Coordinators, various engineering firms, and five staff from the Division of Watershed Stewardship.

Two stormwater retrofit projects in the City of Seaford are currently planned and expected to be complete by the end of the 203 Milestone period. One at the Seaford Central Elementary School involves enlarging a dry pond to receive runoff from untreated areas and converting the dry pond to a bioretention system. The other project includes converting one dry pond to a wet pond, converting another dry pond to a shallow wetland system, and adding a new wet pond.

While source controls would be far more cost effective than retrofitting urban stormwater practices, their benefits are not as well accounted for in the P5 model. Delaware would like to work more closely with EPA and the Chesapeake Bay modelers to ensure these benefits will be adequately credited in its overall strategy to reduce pollutant loads to the Chesapeake Bay.

Redevelopment projects will be required to construct in accordance with the current Sediment and Stormwater Regulations, essentially retrofitting areas as they become redeveloped. Drainage Improvement Projects that receive any type of State assistance will have Green Technologies incorporated into the design as funding is available.

Data Collection and Management

One of the data gaps identified early in the development of the WIP was information on the area treated by existing urban stormwater management practices. Prior to 2009, the Sediment & Stormwater Program, along with the Kent and Sussex Conservation Districts, partnered together and contracted the development of an updated project tracking database. This updated database, dubbed “MudTracker”, includes data on area treated to help fill this gap. The application itself has already been completed but will likely be an evolving project. The partners are now in the process of inputting historic data into database. Sites within the Chesapeake Bay drainage area were given the highest priority for inclusion and this task has now been completed. This will help address some of the modeling discrepancies noted in the gaps section. Going forward, the data contained in MudTracker will be kept current as new urban stormwater BMPs are brought

on-line. In addition, the Information Technology staff within the Office of the Secretary have automated the data retrieval process from MudTracker in order to facilitate reporting in accordance with the NEIEN schema requirements. While the MudTracker database contains an estimated 90% of the area managed by urban stormwater BMPs within the Chesapeake Bay watershed, there are other Delegated Agencies with jurisdictional areas within the Chesapeake Bay, including the Town of Middletown and New Castle County Department of Land Use. Currently, urban stormwater BMP data is collected manually from these agencies. The Department is exploring the feasibility of linking directly to the digital data in order to facilitate the reporting process. A decision as to whether to pursue this option is expected during 2012.

7.1.1.5 Contingencies

If needed load reductions for the urban and suburban sector cannot be met using current best available technologies (BAT), the technology will need to improve in order to meet any shortfalls. Since Delaware is not currently focusing efforts on retrofits due to their expense, if it is determined that retrofits are indeed necessary, Delaware will strive to identify funding sources that can support these projects.

The Department has proposed to use funding through the Chesapeake Bay Regulatory Grant to enhance the inspection and compliance assistance/enforcement capabilities State-wide as well as within the Chesapeake Bay watershed. Continued funding beyond the time limit of this grant will be critical to provide this heightened level of effort.

Additional Federal requirements will be necessary if authority under State regulations cannot meet these goals.

7.1.2 Surface Water Discharges Section

Another program with a similar goal for improving water quality is the [Surface Water Discharges Section](#) (SWDS). The SWDS supports the development of the Chesapeake Bay WIP in regards to industrial storm water, municipal storm water, and wastewater. The SWDS regulates point sources of pollution including municipal and industrial wastewater treatment systems and their construction, biosolids applications, and storm water discharges associated with industrial activities. The SWDS is responsible for issuing regulatory permits under the NPDES program. With respect to storm water, there are several options in NPDES permitting; general permit program for industrial storm water sites, individual NPDES permits for sites, and individual Municipal Separate Storm Water Sewer Systems (MS4s) permits issued to towns or municipalities over a certain population, or issued to other agencies where storm water runoff has been identified to be of concern.

7.1.2.1 General Permit Coverage for Industrial Storm Water and Individual NPDES Permits

7.1.2.1.1 Overview and Current Capacity

The NPDES program was established by amendments to the Federal Water Pollution Control Act in 1972. Those amendments prohibited the “point source” discharge of a pollutant to “waters of the U.S.” unless sanctioned by a permit issued by the newly formed Environmental Protection Agency. The amendments also included provisions that allow EPA to delegate its permitting authority to a State. The EPA delegated its basic NPDES authority to the State of Delaware on April 1, 1974. The Department’s *Regulations*

Governing the Control of Water Pollution were promulgated in 1974 and became effective on March 15, 1974. The first individual NPDES permits were issued in 1974. The State wasn't given the authority to issue permits to federal facilities. The authority to issue general permits was granted in 1992. EPA retains its NPDES authority for federal facilities and pretreatment.

The main focus of the [General Industrial Storm Water Permitting Program](#) is to prevent the contamination of storm water runoff from a facility by properly handling and storing materials. The General Permit Program is designed to provide NPDES permit coverage to a specified group, category or class of industrial activity, that are required to abide by criteria set forth in the general regulations, [Section 9.1 of the Regulations Governing the Control of Water Pollution \(General Permit Program\)](#). These regulations outline the general provisions or requirements that apply to all discharges within the specified category. Currently, the industrial storm water program requires monitoring of storm water effluent under certain Standard Industrial Classification (SIC) codes, but data is not required to be submitted unless requested by DNREC. Regulated facilities can obtain permit coverage by submitting a "Notice of Intent (NOI)" form or a "No Exposure" Certification Form. "No Exposure" means that all industrial materials and activities are protected by a storm resistant shelter to prevent exposure to rain, snow, snowmelt, and/or runoff. Submittal of the NOI or No Exposure forms cover a facility under [Section 9.1 of the Regulations Governing the Control of Water Pollution \(General Permit Program\)](#) and requires a facility to comply with all requirements outlined within the regulations, including the creation of a Storm Water Pollution Prevention Plan (SWPPP) where applicable.

Conversely, an individual NPDES permit is tailored to a specific discharge and location. These are typically outfalls from municipal wastewater treatment facilities or industrial plants that discharge to surface waters of Delaware. The NPDES permit specifies limitations, monitoring requirements, and other terms and conditions that the permittee must meet in order to be allowed to discharge, and includes storm water management measures.

Of the nearly 400 sites currently under the General Permit Program in Delaware, approximately 50 of those are located within the Chesapeake Bay Watershed. For the individually-permitted sites in Delaware, there are currently five that exist within the Chesapeake Bay Watershed.

Previously, an inspection tracking system for sites under both the General Permit Program and individual NPDES permits had not been in place, so precise calculations for inspection frequency and compliance rates were more time consuming. It has been the SWDS inspection policy to inspect sites under the General Permit Program (having full coverage under an NOI) once every three (3) years at a minimum, while No Exposure Certified facilities are inspected at a minimum of once every five (5) years. This policy has been in place since the program's inception. EPA's Regional Administrator for Region 3 approved Delaware's General Permit Program on October 23, 1992. The Department's water pollution control regulations were amended on June 30, 1993 to include provisions for regulating discharges of storm water associated with industrial activities and became effective on July 10, 1993.

In regards to compliance assistance or enforcement, the industrial storm water program has traditionally based its program on compliance assistance utilizing voluntary compliance via inspection results. In early 2011, one site under the General Permit Program (located in the Delaware Watershed) was issued an Administrative Penalty, a Departmental process which allows for substantial financial penalties.

Sites having individual permits have strict oversight and monitoring, where all TMDL allocations are being strictly followed. The Compliance and Enforcement Branch under the SWDS conducts Compliance Sampling Inspections (CSI) or Compliance Evaluation Inspections (CEI) on a frequency that has historically been kept to a schedule of once a year for major individual permits, while minor individual permits are typically inspected once every two years. This policy has been in place since the inception of the program.

DeIDOT industrial storm water facilities, which are permitted through the Industrial Storm Water General Permit, are inspected annually by DeIDOT staff, and are inspected by SWDS staff at the schedule as provided above for sites that fall under the General Permit Program. The new Phase I MS4 permit in Delaware for New Castle County/DeIDOT (in draft as of September, 2011), along with other co-permittees partially located within the Chesapeake Bay Watershed, will be requiring the MS4 to inspect certain industrial facilities within their MS4 jurisdictions, annually, with DNREC assistance and evaluation. In order for this paradigm shift to become completely effective, whereby all sites within the jurisdiction can be inspected and enforced by the MS4, the *Regulations that Govern The Control of Water Pollution* (Section 9.1) must be revised to legally allow the MS4 to take over such inspection and enforcement responsibilities. Revisions to the aforementioned regulation are currently underway. DNREC is currently working with EPA for final approvals regarding the Phase I MS4 New Castle County/DeIDOT permit, which is anticipated to be implemented during calendar year 2013.

7.1.2.1.2 Tracking and Reporting Protocols

The SWDS conducts inspections of sites covered under individual permits and under the General Permit Program, where inspection documentation and enforcement/compliance are audited by EPA through the State Review Framework process.

The SWDS began utilizing the newly developed Access database in October 2010, where the timeframe from October through December 2010, was utilized as a test run of the new system. The new database officially became effective starting January 1, 2011. This database tracks all inspections and enforcement actions for each site. An ArcGIS data layer has also been created to improve tracking of industrial storm water sites.

7.1.2.1.3 Gap Analysis

Lack of Automated Inspection Tracking System – SWDS has reviewed the inspection process for sites that fall under the General Permit Program in order to identify ways to make these inspections more efficient, from routing (getting to the sites) to inspection documentation. One of the ways identified was to create a database for easier tracking and generating inspections. Prior to January 1, 2011, an automated inspection tracking system for sites under both the General Permit Program and individual NPDES permits had not been in place; therefore, precise calculations for inspection frequency and compliance rates were timely to calculate. However, the development of the new database will allow for tracking such parameters more easily in order to increase program efficiency.

Increased Inspection Frequency Needed for Sites Under the General Permit Program- SWDS has reviewed the inspection process in order to identify ways to make these inspections more efficient, from routing (getting to the sites) to inspection documentation. Inspection frequency for sites having individual

permit coverage was determined to be adequate, functioning at a very high level of oversight and compliance/enforcement. However, inspection frequency and compliance for sites falling under the General Permit Program was determined to be an area where additional resources are needed. Inspections for such sites are currently conducted, on average, once every two to three years per site. With nearly 400 industrial storm water sites in Delaware, the Department identified the need for one additional full-time employee so that inspections can be conducted more frequently. The Chesapeake Bay Regulatory and Accountability Grant has allowed for this to occur for sites within the Chesapeake Bay Watershed, but only for a two-year period, the duration of the grant. The continued funding of this position has been requested for the next round of grant funds. The SWDS is currently on-task for the grant requirement of inspecting industrial storm water sites within the Chesapeake Bay Watershed once per year utilizing the funding and assistance provided by the addition of one full-time seasonal staff.

Need to Update Industrial Storm Water Regulations - To improve water quality, the SWDS has also identified the need to revise the Industrial Storm Water Regulations (in addition to the regulatory update for the Sediment and Storm Water Program) and adopt a BMP technical guidance documents for the utilization by site owners who are covered under the *Regulations that Govern the Control of Water Pollution*, Section 9.1. Currently, the Industrial Storm Water Program requires monitoring of storm water effluent for certain industry types, but no submission of data or annual reporting, unless the data is specifically requested by DNREC. SWDS staff is considering, through regulatory development, possibly requiring submission of water quality data to the Department, also a requirement contained within the newest federal EPA Multi-Sector General Permit. The Department believes that the recent addition of the one full-time two-year employee, provided through the Chesapeake Bay Regulatory and Accountability Grant, will not be adequate for taking on the additional responsibility of data entry and water quality tracking, duties identified as being administrative in nature, for the 400 sites. In order to meet this demand, additional staffing resources are needed.

Need for GIS data Collection and Tracking for Sites - GIS data for all industrial storm water sites and some individual permitted sites were non-existent, as of January 2010. Management staff within SWDS has identified the necessity of tracking such information, geospatially, as a quick evaluation tool when an environmental incident such as a fish kill occurs within the vicinity of a site, or a chemical release occurs in the vicinity of a stream or other waterbody. This task has been accomplished and is discussed below.

Need for Improved Education and Information Access - During the time of initial assessment, a website for the Industrial Storm Water Program was not in place; therefore, educational material was determined not to be readily available to the public and to industrial site owner/operators. Only general information about the section existed, with no digital availability of the necessary forms (NOI and No Exposure). A website is now available for the distribution of information.

7.1.2.1.4 Strategy to Fill Gaps

Lack of Automated Inspection Tracking System - This task has been completed and the new data tracking system is currently under operation.

Increased Inspection Frequency Needed for Sites under the General Permit Program – With a shortage of permanent, full-time staff, it is undetermined how DNREC SWDS will acquire additional funding to accommodate one permanent full-time employee dedicated to conducting inspections. The Chesapeake Regulatory and Accountability Grant has provided funding for one two-year seasonal employee, where the

added staff has been utilized to increase inspection frequency and enforcement/compliance for sites within the Chesapeake Bay Watershed; however, this is a short-term solution to a much larger problem of needing two permanent field employees (at a bare minimum) to conduct inspections for all sites within Delaware. Additionally, if water quality reporting will be mandated through the new Industrial Storm Water Regulations for all sites across the state, additional administrative staffing will also be necessary.

Need to Update Industrial Storm Water Regulations - Federal funding was recently provided through the Chesapeake Regulatory Grant to assist the SWDS with revising the regulations, and creating a BMP technical guidance document for industrial storm water. These revisions are separate to the updates associated with the Delaware Sediment and Storm Water Regulations. A revised working draft of the new Industrial Storm Water Regulations, an effort headed by the SWDS, is expected to be completed by December, 2012, and will include stricter standards and more monitoring requirements for sites within the Chesapeake Bay. Regulatory promulgation is expected to occur in 2014.

Need for GIS data Collection and Tracking for Sites - From January 2010 through September 2011, SWDS staff has made it a priority to collect GIS data for all nearly 400 sites through the state generated utilizing a combination of modeling software (ArcGIS 9.3) in conjunction with address data. For the sites where locational data was generated using addresses in conjunction with the modeling software, a correlation coefficient was generated, where all data points having greater than 99% confidence were utilized, while sites having a confidence interval of less than 99% were disregarded and geospatial data for those sites were collected using a handheld GPS unit (Garmin 76), where data was collected to the 0.000001 accuracy in decimal degrees utilizing Wide Area Augmentation System (WAAS).

All site data is currently being land-truthed and verified, where all sites within Sussex County and the Chesapeake Bay Watershed have been verified to be accurate as of September 2011. Approximately 50% of sites within Kent County have been land truthed, while less than 10% have been completed in New Castle County.

Need for Improved Education and Information Access - In July, 2010, the SWDS created a website for Delaware's Industrial Storm Water Program, where all forms and other educational material can now be accessed online. All forms were re-formatted to be writable .pdf forms, making submission of forms easier for users. This website address now appears on all written correspondence that is generated and sent to site owner/operators.

Data Collection and Management

As part of the Chesapeake Regulatory and Accountability Grant, one two-year seasonal employee was hired by the SWDS to conduct inspections and to collect applicable water quality data from all sites within the Chesapeake Bay that are covered under the Regulations that Govern the Control of Water Pollution, Section 9.1. Such data is vital to determine current compliance rates, as data submission is not required under the current state regulation. It was determined that very little data of this nature currently exists. The new regulation revision process will investigate federal requirements pertaining to monitoring, and will include some aspect of data reporting for nutrient and sediment for sites within the Chesapeake Bay Watershed.

The SWDS began piloting the newly developed Access database in October, 2010, with official use beginning in January, 2011. This database tracks all inspections and enforcement actions for each site. An ArcGIS data layer has also been created to improve tracking of industrial storm water sites.

7.1.2.1.5 Contingencies

If needed load reductions for the urban and suburban sector cannot be met using current best available technologies (BAT), the technology will need to improve in order to meet any shortfalls. Since Delaware is not currently focusing efforts on retrofits due to their expense, if it is determined that retrofits are indeed necessary, Delaware will strive to identify funding sources that can support these projects.

The Department has proposed to use funding through the Chesapeake Bay Regulatory Grant to enhance the inspection and compliance assistance/enforcement capabilities State-wide as well as within the Chesapeake Bay watershed. Continued funding beyond the time limit of this grant will be critical to provide this heightened level of effort. Additionally, the capability for the State of Delaware to require sites as covered under the Industrial Storm Water General Permit Program to submit water quality data is contingent upon the availability of funds for additional staffing, where future state funding is not expected.

7.1.2.2 Individual NPDES Permits for MS4s

7.1.2.2.1 Overview and Current Capacity

Urban storm water runoff is commonly transported through [MS4s](#), and is often discharged, untreated, into local water bodies. To prevent harmful pollutants from being washed or dumped into an MS4, certain operators, based on population, must obtain a NPDES permit (Phase I or Phase II) and develop a storm water management program. Phase I, issued in 1990, requires medium and large cities or certain counties with populations of 100,000 or more to obtain NPDES permit coverage for their storm water discharges. Phase II, issued in 1999, requires regulated small MS4s in urbanized areas, as well as small MS4s outside the urbanized areas that are designated by the permitting authority, to obtain NPDES permit coverage for their storm water discharges. Currently, 25% of Delaware is covered under the MS4 program, with only a small portion of the Chesapeake Bay Watershed having MS4 permit coverage.

DNREC has information on all existing MS4 areas. Currently, permit areas are delineated by jurisdiction, and not watershed. Future geographic boundaries are currently unknown and pending further guidance from EPA. A small portion of the New Castle County/DelDOT Phase I MS4 area falls within the Chesapeake Bay Watershed. There are no other MS4 areas currently within the watershed. This permit is in the process of being updated, and will address state water quality standards and TMDLS for the Chesapeake Bay Watershed.

It is DNREC's intent to refer to the DSSR for all construction and post construction storm water management measures in all future MS4 permits. The new regulations will apply to all areas both inside and outside MS4s, and will address all needs in regards to green technology requirements, post construction maintenance measures, and water quantity and quality requirements.

Specifically within the Chesapeake Bay Watershed communities, DNREC has determined by analyzing land use patterns, that retrofits are not the solution to reduction of pollution loading in this area; however, within the new draft Phase I MS4 permit for New Castle County/DelDOT with portions of that permit area

lying within the Chesapeake Bay Watershed, Watershed Improvement Plans will be required which will contain some elements of retrofitting, within two selected watersheds within the MS4 boundary, not necessary required to fall within the Chesapeake Bay Watershed Area.

All BMPs constructed both within and outside MS4 areas are inspected regularly throughout the state, not only through MS4 permit commitments, but also through mandates relating to the current DSSRs, which additionally requires property owners to regularly maintain BMPs.

Of the MS4 permitted agencies in Delaware, DelDOT alone began the storm water system inventory and inspection in 2001 in New Castle County. Beginning in 2007, the inventory and inspection process included Kent and Sussex Counties. As of August 2011, 96,600 structure points (inlets, manholes, outfalls, swale ends), and 15,800,000 linear feet of conveyance (pipes, swales) have been inventoried and inspected. Within the Chesapeake Bay Watershed, DelDOT has inventoried and inspected 9,300 structure points and 3,300,000 linear feet of conveyance.

New Castle County (NCC), also an MS4 permittee, began the storm water inventory and inspection in 2001. As of September 2011, NCC has 1545 BMPs that are inspected in the unincorporated areas of New Castle County, with 51 of these located within the Chesapeake Bay Watershed.

7.1.2.2.2 Tracking and Reporting Protocols

Audits of the MS4 permittees are conducted by SWDS twice within each five-year permit term. MS4s are audited according to the same general schedule if the permit has been administratively extended. The program audit is a comprehensive evaluation of all components of the MS4 program, assessing overall implementation and identifying deficiencies prior to permit renewal. Specifically, the audit evaluates program implementation and maintenance used to address the six (6) minimum control measures as identified in the Storm Water Management Plan (SWMP). The audit evaluates requirements as written in the permit, as committed in the SWMP, and as required under the Federal regulations. Audit reports summarize the findings of the MS4 audit in the same order and format of the Permit. Each program component section contains a summary of the findings for the program component and associated required and recommended actions. The recommended actions are based on programs that are being implemented by other MS4s throughout the state or initiatives driven by the EPA. The Surface Water Discharges Section will largely utilize the tri-annual delegation review conducted by the DSSWP to determine compliance within the MS4 permit conditions relative to Erosion and Sediment Control and Post Construction Stormwater.

For the MS4 program in Delaware, an annual report is additionally required for all permitted jurisdictions, which must be submitted to SWDS, annually, by the deadline as outlined within the SWMP. Permanent BMPs and maintenance of these facilities, such as wet ponds, dry ponds, and infiltration basins, are contained within in the MS4 tracking system of the entity that is permitted which are already being reported to the Chesapeake Bay Program. A database has recently been created to track MS4 reporting.

7.1.2.2.3 Gap Analysis

Currently, all MS4 permits within Delaware are expired and have been administratively extended, including the one MS4 permit that currently lies within the watershed boundary (Phase I NCC/DelDOT permit). Only a small percentage of the Chesapeake Bay Watershed within Delaware has MS4 permit coverage;

therefore, future state initiatives include evaluating additional permit MS4 coverage areas for those urbanized areas within the Chesapeake Bay Watershed.

Relative to the renewal of the draft Phase I MS4 permit for new Castle County and DeIDOT, DRNEC is working with EPA to finalize permit language before it goes to public comment. After this permit is finalized and administered, the remaining Phase II permits in Delaware will follow.

DNREC's Sediment and Storm Water Program, DeIDOT, and DNREC's SWDS have determined that additional funding is necessary in order to support heavier implementation and additional enforcement and compliance. With current economic status, the regulatory agencies have not been able to meet full staffing capacity, let alone hire additional staff.

7.1.2.2.4 Strategy to Fill Gaps

Although a permit renewal schedule was provided to EPA in August, 2010, which outlined specific tasks and milestones for renewing these permits, legal complications have hampered timely progress in order to meet renewal goals that had been established within the proposed timeline.

Within the Chesapeake Bay Watershed, the new Phase I NCC/DeIDOT permit is in the process of being re-drafted and re-issued. Additionally, outreach and education, among other BMPs, is incorporated into MS4 permits. Activities within the MS4 portion of the watershed will depend on local jurisdictions updating comprehensive plans, ordinances, and codes to be consistent with nutrient and sediment reduction goals. The draft permit calls for the creation of jurisdiction-wide Storm Water Pollution Prevention and Management Plan (SWPP&MP) and associated sampling protocol, which will be held to strict deadlines that are outlined within the permit.

During the current economic conditions, funding for BMP implementation remains a challenge that the Department and permittees continue to work on. The Department remains committed to working with the permittees to obtain the funding that will be required to implement the requirements outlined in the MS4 permit. Several funding options are being reviewed including the implementation of a stormwater utility, application for federal grants, and other mechanisms.

DNREC has continued to work in cooperation with both the permittees and with EPA to finalize the Phase I MS4 New Castle County/DeIDOT permit. However, due to unforeseen potentially legal obstacles relating to some of the permit language, it has taken longer than originally anticipated in working toward a completed, final permit. It is expected that the Phase I MS4 permit will be implemented sometime during the calendar year of 2013. The outcome of updating the Phase II permits in Delaware heavily hinge upon the content contained within the Phase I permit, and will subsequently follow.

After all existing MS4 permits in Delaware are renewed, the SWDS will work with local communities to assist in accomplishing their goals and will additionally evaluate the need for further MS4 coverage within the Chesapeake Bay and throughout the state, after analyzing future growth patterns and existing population data (2010 census).

As always, the SWDS will continue to work with EPA in the timely submittal of draft permits for review and approval.

Data Collection and Management

Both a digital framework in addition to hard-copy files are being maintained for all associated documentation through the MS4 program in Delaware. In January, 2011, SWDS management staff began requiring the digital submission of annual reports, also requiring that a digital table of contents exists on the left hand margin for all documents. This request was made in order to better accommodate EPA when annual reports were requested, as such extensive hard copies were time consuming and expensive to reproduce, in addition to the time and expense related to mailing.

All new MS4 permits that will be issued in Delaware will include an appendix outlining reporting requirements, along with the attachment of a summary sheet, per EPA's request.

7.1.2.2.5 Contingencies

The progress of issuance of Phase II MS4 permits in Delaware is contingent on the issuance of the Phase I New Castle County/DelDOT permit. If needed load reductions for the urban and suburban sector cannot be met using current best available technologies (BAT), the technology will need to improve in order to meet any shortfalls. Since Delaware is not currently focusing efforts on retrofits due to their expense, if it is determined that retrofits are indeed necessary, Delaware will strive to identify funding sources that can support these projects.

The Department has proposed to use funding through the Chesapeake Bay Regulatory Grant to enhance the inspection and compliance assistance/enforcement capabilities State-wide as well as within the Chesapeake Bay watershed. Continued funding beyond the time limit of this grant will be critical to provide this heightened level of effort.

7.2 Best Management Practices

Stormwater management practices used in Delaware have evolved over the years from traditional treatment practices to the more contemporary use of Green Technology practices that promote recharge and reuse of stormwater runoff. The water quality benefits from the former class of treatment practices are based on their pollutant removal efficiency which in turn is largely based on physical settling and filtering processes. The original technical standards under the DSSR that went into effect in 1991 were based on 80% reduction in annual TSS loads for the first inch of runoff.

Green Technology practices, on the other hand, achieve their benefits through reducing stormwater runoff volume. This not only reduces pollutant loadings, but it also has the added benefit of protecting receiving waters from the hydrologic impacts associated with new development. Green Technology practices were initially introduced into the DSSR through revisions that became effective in 2005 which elevated them to the highest preference in the stormwater BMP hierarchy. The current technical standards for these practices require that they be sized to manage the runoff from a 2.0", 24-hour rainfall, which is approximately the 6-month frequency storm event for Delaware.

The proposed revisions to the DSSR will increase the required treatment volume to the annualized runoff from the 1-year frequency storm event, which is approximately 2.7" of rainfall in Delaware. This would capture and treat all runoff up to the 99th percentile annual precipitation. For new development, the initial goal would be to employ runoff reduction practices to the maximum extent practicable (MEP) to capture

runoff volume such that the effective imperviousness for the site is brought down to 0% thereby reducing pollutant loadings by an equivalent amount. Redevelopment projects would be required to reduce their effective imperviousness to 50% of the existing condition, with a consequential 50% reduction in the existing pollutant load. If site conditions are such that the runoff reduction criteria cannot be met, an offset must be provided such that equivalent runoff reduction objectives can be met elsewhere in the project watershed. Applicants may employ additional stormwater treatment practices to reduce the offset requirement. This approach is consistent with the recommendations from the National Research Council's report on "*Urban Stormwater Management in the United States*", as well as recent EPA policy memoranda that recognize stormwater flow and volume management as appropriate surrogates for meeting overall water quality and habitat protection goals and objectives.

Although the Chesapeake Bay Phase 5 model has some capability to account for the benefits of these newer Green Technology practices, they are not explicitly modeled as runoff reduction practices. EPA's Scenario Builder spreadsheet tool is used as the interface between BMP data collected by the states and the pollutant reductions as predicted by the Phase 5 model. It is felt that the BMP classifications used in the model will need to expand in order to measure the true benefit of Delaware's Green Technology practices and runoff reduction objectives. The following sections provide an overview of the urban stormwater practices used in the current model and some discussion on Green Technology practices that are not adequately represented.

7.2.1 Scenario Builder BMPs

The following BMP data has been updated based on the data collection efforts identified in the Phase I WIP. All of the BMPs below have been included in input decks at the land river segment scale.

7.2.1.1 Bioretention

As of the 2010 progress run, Delaware has on record 33 acres of bioretention facilities. As new lands are developed, new stormwater practices, with an emphasis on runoff reduction practices, will be implemented.

GOAL: Maintain existing facilities.

7.2.1.2 Bioswale

As of the 2010 progress run, Delaware has on record 341 acres of bioswale facilities. As new lands are developed, new stormwater practices, with an emphasis on runoff reduction practices, will be implemented.

GOAL: Maintain existing facilities.

7.2.1.3 Dry Detention Ponds and Hydrodynamic Structures

During the stormwater BMP verification process, one (1) hydrodynamic structure was identified as being located in the Chesapeake Bay drainage area. This practice treats an area of 1.63 acres.

GOAL: Maintain existing and future hydrodynamic structures in the watershed.

7.2.1.4 Dry Extended Detention Ponds

Currently, Delaware has on record 226+ dry extended detention ponds in the Chesapeake treating 2,023 acres. As new lands are developed, new stormwater practices, with an emphasis on runoff reduction practices, will be implemented.

GOAL: Maintain existing 226+ facilities.

7.2.1.5 Urban Filtering Practices

Currently, Delaware has on record 161+ urban filtering practices (biofiltration, filter strip, filtration, forebay micropool) in the Chesapeake treating 459 acres. As new lands are developed, new stormwater practices, with an emphasis on runoff reduction practices, will be implemented.

GOAL: Maintain existing 161+ facilities. Plus, increase implementation by 4.71 acres due to the near term installation of 5 bioretention/rain garden fixtures in the Seaford (Appendix D) area and an additional 5 acres of retrofits for the Seaford/Laurel area.

7.2.1.6 Urban Infiltration Practices (no sand or vegetation; no underdrain)

Currently, Delaware has on record 86+ infiltration practices in the Chesapeake treating 749 acres. As new lands are developed, new stormwater practices, with an emphasis on runoff reduction practices, will be implemented.

GOAL: Maintain existing 749 acres.

7.2.1.7 Urban Infiltration Practices (with sand or vegetation; no underdrain)

Delaware does not currently report this practice, however it is likely occurring as a subset of bioretention practices. Classification of the so-called "Green Technology BMPs" will be more consistent with the naming conventions used in the Chesapeake Bay model when the revised Sediment & Stormwater Regulations and supporting technical documents are implemented.

GOAL: TBD.

7.2.1.8 Wet Ponds and Wetlands

As of the 2010 progress run, Delaware has on record 219+ wet pond and wetland structures in the Chesapeake; treating 5,766 acres. As new lands are developed, new stormwater practices, with an emphasis on runoff reduction practices, will be implemented.

GOAL: Maintain existing 219+ facilities.

7.2.1.9 Erosion and Sediment Control

Currently, Delaware previously reported to the Bay Program 42 erosion and sediment control sties in the Chesapeake; however the value is out of date and area corresponding to the sites is currently being determined from a database. Using the DNREC on-line permit database, there have been over 700 Notices of Intent (NOIs) issued since 1/1/2009 State-wide. There are many more still listed as "Active" in the database prior to that date. DNREC is currently working to update the NOI extract in order to QA/QC

this data and determine how many are in CB. As new lands are developed, new stormwater practices, with an emphasis on runoff reduction practices, will be implemented. The DSSR require erosion and sediment control on any land disturbing activities exceeding 5,000 square feet.

GOAL: 100% of all sites.

7.3 Street Sweeping

DelDOT currently can report only the curb miles that nominally were swept in each watershed, according to the Department's 4:2:1 protocol. At present there is not an easy way to verify those numbers. Therefore, DelDOT has asked each of the Maintenance Districts to begin to track the sweeper wastes that they take to the Delaware Solid Waste Authority landfills. For New Castle and Kent Counties, this should allow for the reporting, at least approximately, of total loads removed from the roadways each year. It won't provide any watershed-level information. DelDOT's contractor is current assisting them in developing a new street sweeping strategy for the new Castle County Phase I Permit that will provide the best water quality benefit at a practicable cost (most likely focusing on closed drainage and pollutant hot spots). And unfortunately, the Sussex County yards handle their sweeper wastes differently. Beginning in the spring of 2012, DelDOT plans to install GPS units on a few of their sweepers so that they can build a model to help optimize the sweeping program and report pollutant loads removed. It is hoped that within a couple of years all of the vehicles will have GPS units and DelDOT will be able to provide verification and reports on pollutant reductions from sweeping, broken down on any geographic scale that is chosen.

GOAL: 3,143 acres; DelDOT will continue to meet the MS4 permit requirements for street sweeping. This acreage goal represents an accurate reporting of sweeping that is likely already occurring and not a large increase above and beyond current efforts.

7.3.1.1 Stream Restoration

This practice offers additional benefits besides pollutant reduction credits. Stabilizing impacted streams, restoring natural morphology to channelized systems and installing water control structures on existing drainage ditches all have the potential to greatly improve overall watershed health and function. This will also help meet some of the restoration goals discussed in Section 10 of this document.

GOAL: Develop standards and specifications for this practice to facilitate implementation and work with EPA to determine benefits. Maintain 200 feet of restoration on a low density pervious site in the Seaford area.

7.3.2 Additional BMPs Not Currently Included in Scenario Builder

7.3.2.1 Spill Prevention and Response

All industrial sites and sites that are covered under an individual permit and under the General Permit Program are required to adhere to strict BMPs relating to storage and spill prevention. These requirements are outlined in their mandated Storm Water Pollution Prevention Plan (SWPPP), individual for each site.

GOAL: The SWDS will develop a BMP manual strictly for industrial storm water sites to be available at the time of the revised industrial storm water regulations. A draft is anticipated to be completed by the end of calendar year, 2012, and regulatory promulgation is expected in 2014

7.3.2.2 Educational BMPs

All MS4 permits contain educational BMPs for storm water.

GOAL: SWDS will continue to conduct MS4 audits and issue enforcement and/or penalties as necessary if such BMPs are not maintained and properly reported on, accordingly.

7.3.2.3 Vegetated Roofs

While relatively uncommon at this point, this practice is expected to become more popular as LEED certification becomes more prevalent.

GOAL: Standards and specifications for this practice are currently being developed under the proposed revisions to the Delaware Sediment & Stormwater Regulations; work with EPA to determine benefits.

7.3.2.4 Rainwater Harvesting

Rain barrels can be effective at the individual lot scale, while larger installations using cisterns can augment irrigation of landscaped areas.

GOAL: Standards and specifications for this practice are currently being developed under the proposed revisions to the Delaware Sediment & Stormwater Regulations; work with EPA to determine benefits.

7.3.2.5 Impervious Disconnection

Directing stormwater runoff onto turf or wooded areas can significantly reduce annual runoff volumes compared to a connected system of curbed streets and stormdrains.

GOAL: Standards and specifications for this practice are currently being developed under the proposed revisions to the Delaware Sediment & Stormwater Regulations; work with EPA to determine benefits.

7.3.2.6 Soil Amendments

Research is beginning to show that this can be an effective practice for improving the hydrologic condition for poor and/or compacted soils.

GOAL: Standards and specifications for this practice are currently being developed under the proposed revisions to the Delaware Sediment & Stormwater Regulations; work with EPA to determine benefits.

7.4 Funding Opportunities

The funding opportunities to improve stormwater quality in the Bay watershed are tied to several funding sources. The State Revolving Loan Fund (SRF) has recently been expanded to include “green projects” of which stormwater is a major component. Recent projects approved for a low interest loan have included a major flood abatement project in Seaford which integrated a water quality component to the project. More projects may seek this funding in an effort to improve community drainage, and a strategy should be employed to assure that a water quality benefit is also a part of the project design.

The state has utilized a special fund named the 21st Century Resource Conservation and Development (RCD) fund to finance major and minor flooding and drainage projects throughout the state for the past 16 years. While these funds are limited, there should be a concerted effort to integrate water quality management in a retro-fit manner into projects funded through this revenue stream.

State cost share funds if enhanced, could be made available for funding more urban projects with a demonstrated water quality benefit in the future. These funds are made available to landowners and could be expanded to include municipalities with a plan for identifying and implementing water quality practices.

The Financial Assistance Branch (FAB) of DNREC through the leadership of the Clean Water Advisory Council (CWAC) is developing a program to deliver funding to municipalities through Stormwater Planning Grants which would require that priority water quality goals be met. In addition, the CWAC and FAB have developed funding through community water quality grants that serve to improve water quality through matching grants.

Other grant funding through Section 319 Grants as well as direct grant funds through the Chesapeake Bay Program and other sources such as National Fish and Wildlife Federation will be used within the watershed, although most of these funds in the past have not been used in the urban corridors. This strategy is changing and more funding in the future will be directed toward the developed portion of the landscape.

The Department will also aggressively seek additional funding and work with the towns, municipalities and the Conservation Districts to identify resources and utilize them to the extent possible to meet the growing demands for funding stormwater source reduction strategies and retro-fits within the Bay watershed.

7.5 Sea Level Rise Considerations

Sea level rise will increase the water level of oceans, estuaries, rivers, and streams and may also increase groundwater levels. This has potential implications for stormwater management. In some cases, stormwater management utilizes outfalls to streams or rivers and if these outfalls become submerged, stormwater may back up into communities causing flooding. Recently, there has been a transition emphasizing managing stormwater onsite and allowing for greater recharge of water. If ground water levels increase under sea level rise scenarios, it may result in some of these types of practices not draining as originally designed. Typically stormwater facilities have a lifespan of approximately 20 years and any areas that may potentially be impacted by rising sea level may not see effects until much further into the future. As stormwater facilities age and are retrofitted, outfall location and ability to drain under higher ground and surface water conditions should be considered.

SECTION 8. LAND USE

This section of the WIP was prepared by the Land Use Subcommittee. This group included representatives of the Department, the Office of State Planning Coordination, the Department of Agriculture, the University of Delaware's Sustainable Coastal Communities Program, the Home Builders Association of Delaware, Sussex County, Kent County, and New Castle County, Town of Bethel, Town of Blades, Town of Bridgeville, Town of Delmar, Town of Ellendale, Town of Georgetown, Town of Greenwood, Town of Laurel, Town of Middletown, and City of Seaford. This group addressed elements of the Watershed Implementation Plan related to future land use planning and growth, and the development of opportunities and tools for compliance for local government partners.

The largest city entirely contained within Delaware's portion of the watershed is Seaford, with a population of approximately 7,000; the smallest is Bethel, with 188 residents. Most of the explosive growth in Sussex County during the mid-2000s occurred on the eastern, coastal side of the county, so this section of the county remains extremely rural. In New Castle County, Middletown (pop. 18,600) is the largest city partially contained within the watershed, although its growth in this westerly direction has to date been restrained by its comprehensive plan and the use of Transfer of Development Rights to preserve land.

8.1 Current Programs and Capacity

8.1.1 Comprehensive Planning and Land Use Review

Planning and zoning in Delaware is a function of local government. All municipalities have very different approaches to managing growth. The State has limited ability to influence – or reject --- individual projects within counties and towns. However, each of Delaware's 57 local governments (including its three counties) is required by state code⁴ to prepare a comprehensive plan every ten years, with five year updates. Towns are not permitted by State law to annex new territory without a comprehensive plan. The State certifies each jurisdiction's comprehensive plan, ensuring that it has met requirements of the law, and withholding of certification can have fiscal consequences for a local government.

Statewide land-use planning mechanisms such as the Preliminary Land Use Service and Strategies for State Policies and Spending provide guidance for local governments managing growth. The [Preliminary Land Use Service](#) (PLUS)⁵ is a proactive program used to ensure that any sort of land use activity is carefully examined for potential adverse impacts to land and water before implementation or extensive investments are made. PLUS requires applicants to obtain a state agency review of their proposal for major land use changes before submitting their proposals to local governments. The value and knowledge gained from reviews by state agencies at the start of the land development process assists and supports land use decisions made by local governments. Land use change proposals are submitted to state agencies through the Office of State Planning Coordination. Applicants have the opportunity to present their project to state agency resource experts to discuss their plans, identify possible problems, and formulate feasible solutions.

Planners and applicants can interact in a constructive dialogue in a streamlined manner to formulate an ideal plan of land use action. As a result of this process, the State can respond more quickly and coordinate

⁴ [29 Del. C. § 9103](#); [9 Del. C. c. 26](#); [9 Del. C. c. 49](#); [9 Del. C. c. 69](#); and [22 Del. C. c. 7](#)

⁵ [29 Del. C. c. 92](#)

more closely with local timelines. State comments are received promptly, and better reflect state and local land use plans and regulations.

Codified in state law, the state's PLUS and comprehensive planning processes are tools with a significant measure of consistency, enforceability, and authority to meet water quality goals in the Chesapeake watershed.

8.1.2 Public Outreach

The Department has many partners that provide outreach to homeowners and communities in the form of technical assistance, education, and funding for implementation of best management practices within local communities. Partners include, but are not limited to the Delaware Nature Society, Delaware Forest Service, Cooperative Extension, Sussex Conservation District, Kent Conservation District, New Castle Conservation District, Master Gardeners/Cooperative Extension Service, Delaware Center for Horticulture. These partners provide all levels of support for various programs. The contributions by these partners may be detailed in Chapter 7, Chapter 15, and/or Chapter 16 of this document.

The Department and its partners actively reach out to the public through different activities each year to improve water quality. Educating residents about the use of best management techniques on individual residential lots, such as the installation of rain barrels, planting native plants and grasses, regular maintenance of stormwater systems and septic systems, and minimizing fertilizer application are extremely beneficial for improving local water quality. Stenciling storm drains is an activity that involves community awareness as well as community participation. Development of Comprehensive Plans and PLUS require and incorporate a public outreach effort.

8.2 Local Governments

In order for water quality goals to be achieved, there must be cooperation and participation at the local level of government where land use decisions are made. During the WIP development process, staff from DNREC and the Office of State Planning Coordination met individually on multiple occasions with representatives from each local government within Delaware's portion of the Chesapeake. These efforts included explaining what the Chesapeake TMDL and WIP mean to their community, how they can and should participate, and how the state agencies can assist the municipalities with this process, such as with technical assistance and resources like grant opportunities. As a tool for local governments, DNREC arranged for Tetra Tech to review each jurisdiction's ordinances and provide recommendations on how they can be modified to provide additional water quality protections and improvements. A suite of model ordinances was also provided. These recommendations and the model ordinances have been provided in Appendix K and L. A description of each local jurisdiction follows along with their preliminary commitments to helping Delaware achieve WIP goals.

8.2.1 Kent County⁶

The Kent County portion of the Bay watershed includes the headwaters of several watersheds such as the Chester River, Choptank River, and the Marshyhope River. These watersheds constitute nearly one third of the County and fall outside of the County's Regional Growth Zone. The land is predominantly rural agriculture and includes the rural incorporated towns of Farmington, Hartly, and Harrington. From 2008-2010, more than 95 percent⁷ of all residential units approved by Kent County were located inside its designated growth zone where county wastewater treatment service is available or planned.

Summary of Surface Water Management Needs

There are numerous entities involved with surface water management in Kent County (DNREC, DelDOT, Kent Conservation District, Kent County, incorporated municipalities, tax ditch organizations, homeowners associations, and non-profits) and there is a high level of cooperation among these groups. Stormwater management is a regulatory function with oversight provided by DNREC, but delegated to Kent Conservation District; drainage is a non-regulatory function. Kent County government has limited responsibility for surface water management issues in the county.

An assessment of Surface Water Management Services in Kent County was conducted in 2010⁸ to determine the current and projected needs of residents and the costs related to surface water management in Kent County. The assessment evaluated twelve surface water management program elements including costs for managing storm water and drainage, tax ditch management and assistance, watershed modeling for both quantity and quality management, maintenance of and improvements to public infrastructures, maintenance and improvements to private infrastructure, source reduction strategies, flood plain protection and improvement, dam safety, public outreach and public involvement, and planning and regulatory aspects. It was found that approximately \$9.5 million dollars is spent annually in Kent County to manage surface waters; however an additional \$8 - \$16 million is needed annually, county-wide to adequately address surface water management. Specific needs and recommendations included:

- Additional staff to provide post construction and annual maintenance inspections and technical assistance for stormwater management facilities.
- Implementation and technical assistance for property owners in regards to general drainage improvement projects, including large capital projects as well as minor maintenance needs, emergency response, etc.
- Technical and administrative assistance for tax ditch organizations within the state to assist in coordination of inspections and maintenance and implementation of best management practices.
- Development of small watershed models and studies for better water quality management from a whole system approach.
- Maintenance of and improvements to public infrastructure for local jurisdictions for stormwater management, including developing an inventory of stormwater assets for local communities. Restoration of aging stormwater infrastructure is a concern of local jurisdictions.
- In Delaware, there are many situations where private entities are responsible for maintenance of drainage systems; this may include tax ditch organizations or homeowner associations. This can create

⁶ Kent County Contact Information: Michael Petit de Mange. 555 Bay Road, Dover, DE 19901. www.co.kent.de.us.

⁷ This is from 2011 Report on State Planning Issues, prepared for the Governor and General Assembly by the Cabinet Committee on State Planning Issues.

⁸ Kent County Level of Service Assessment, 2010

concerns about maintenance of these systems and ability to pay for infrastructure improvements. An inventory of privately owned/managed stormwater and drainage facilities and maintenance needs and schedules is needed. This will help us to account for retrofit needs and opportunities.

- Implementation of stormwater best management practices and retrofits to existing stormwater facilities in developed areas that have fallen into disrepair.
- Provide education and outreach through workshops and technical assistance to homeowners and property managers on stormwater facility management and maintenance, stormdrain marking, etc.
- Development of county drainage codes or a lines and grades ordinance and consideration of stormwater management and drainage in comprehensive planning.
- Create a stormwater management district to provide funding, oversight and implementation of maintenance of stormwater management facilities within the county.
- Evaluate tax ditch funding mechanisms and structure as a result of changing land uses and surface water management needs.

Summary of Wastewater Activities

To address the growth within the local jurisdictions of Harrington, Hartly, and Farmington which are either fully or partially within the watershed; the County has established plans for connections for these jurisdictions to the County's existing sewer system within the Growth Zone. The waste generated within these municipalities will eventually be transmitted and treated outside of the watershed. However, this leaves a potentially large amount of rural land to be developed within the watershed.

In response to this future growth the County has implemented a series of land use ordinances that are intended to direct growth to the County's established growth zone while allowing for modest growth. Over the past five years the County has established a major subdivision ordinance⁹ which requires large lots of up to four acres in size or more with significant requirements for investment in infrastructure such as dry septic requirements, central water systems and public roads built to State standards. Also the County has restricted private utility wastewater treatment systems throughout the County and as a result of these ordinances no major subdivisions have been recorded within the watershed.

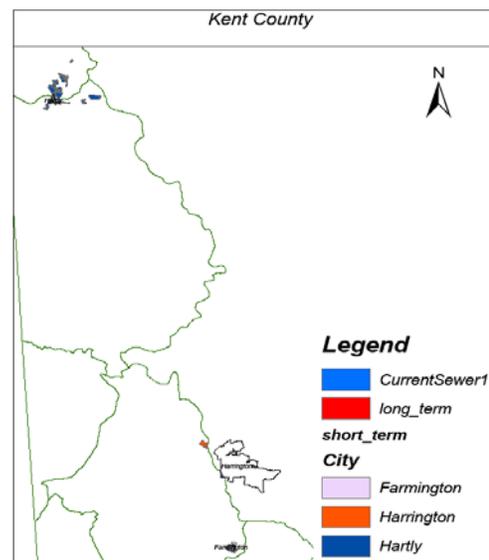


Figure 21: Kent County Wastewater

Prohibition of Community Waste Water Systems: Kent County has prohibited private community waste water systems countywide. While the impetus for this regulation was land use whereby the prohibition of these systems discourages high-density residential development in areas where there are little to no services, it also has the added benefit of protecting water quality.

The County does however allow for single lot subdivisions and minor lot subdivisions of 10 lots or less within all rural portions of the County. This has resulted in the higher number of individual on-site septic systems within the watershed as seen in Table 24. However, as part of the Phase Two implementation process, the State and County will be reviewing these lots to determine when a portion of these may sunset

⁹ Kent County Subdivision Code - <http://www.ecode360.com/7600505>.

in accordance to County code, determine which are unbuildable due to environmental regulations and which ones may be constructed within the period of 2010 to 2025 resulting in a 40% or 2,773 reduction in the number of septic systems with of those 15% or 929 reduction in septic systems and within the period of 2010 to 2017 and an additional 25% or 1,844 reduction in septic systems within the period of 2017 to 2025. These reductions are illustrated within Table 25.

Table 24: Residential Wastewater Type for Kent County

EPA River Segment	2010 Land Use Scenario		2017 Land Use Scenario		2025 Land Use Scenario	
	Septic	Sewer	Septic	Sewer	Septic	Sewer
3520	824	0	1207	0	1435	0
3980	2387	0	3000	0	3380	0
4326	230	0	417	0	493	0
4400	760	0	737	511	1002	479
4560 K	253	0	504	0	655	0
4590 K	198	0	312	0	402	0
Total	4652	0	6177	511	7367	479

Table 25: Proposed Septic Systems Reductions for Kent County

EPA River Segment	2010 Land Use Scenario		2017 Land Use Scenario		2025 Land Use Scenario	
	Septic	Sewer	Septic	Sewer	Septic	Sewer
3520	824	0	1025	0	1076	0
3980	2387	0	2550	0	2535	0
4326	230	0	354	0	369	0
4400	760	0	626	511	751	479
4560 K	253	0	428	0	491	0
4590 K	198	0	265	0	301	0
Total	4652	0	5248	511	5523	479

Nutrient Load Reduction Requirements for On-Site Septics in the Kent County Code: Kent County requires advanced treatment to be used for all new systems to minimize impacts of new nutrient loads. This provision establishes that on-site disposal systems achieve the required nutrient reduction targets in the watershed where a TMDL has been promulgated and a nutrient load reduction established. So, any new on-site septic system located within the Chesapeake Bay Watershed, needs to achieve the nutrient load reductions established by the TMDL through the use of best available technologies. Specifically § 187-53 D (5) stipulates: Individual residential on-site disposal systems sited in a watershed with an established total maximum daily load (TMDL) shall be designed and installed in accordance with the nutrient load reductions prescribed by the TMDL or they shall use the best available technologies in order to achieve the required nutrient reduction targets set for the particular watershed.

Milestone Accomplishments and Activities

Kent County recognizes the impact of its residents on local and regional water resources; as such the Kent County is committed to improving water quality in local watersheds and ultimately the Chesapeake Bay.

Kent County has enacted an ordinance as part of the Subdivision Code¹⁰ which requires riparian buffers to be preserved or reestablished. The Code prohibits clearing or removal of natural vegetation within 100 feet of centerline of a stream.

Kent County will continue to review and update relevant County codes and ordinances as described in the County's Comprehensive Plan to allow for and encourage protection and improvement of local water resources. The Kent County Comprehensive Plan was approved in October 2008¹¹. A review of the Comprehensive Plan will be completed by October 2013. The next update of the plan is due by October 2018.

Kent County has extended sewer service to the Town of Hartly. The sewer expansion project be fully implemented by the end of 2012 and will eliminate 291 of individual on-site septic systems.

The Office of State Planning and Coordination and Kent County will provide an update of the status of development projects approved within the last five years to determine which projects may sun-set. This information will be provided to EPA's Chesapeake Bay Program to be considered in future revisions to nutrient loading calculations for Delaware's TMDL allocation.

Tetra Tech has provided Kent County with a review of their local ordinances along with a set of recommendations for the County to consider as they review and update their ordinances. Tetra Tech has also provided model ordinances for the County's consideration. The recommendations and model ordinances provided to Kent County are available in Appendix K and L.

¹⁰ Section 187-78 (C) of the Kent County Subdivision Code

¹¹ Kent County Comprehensive Plan is available at:

http://www.co.kent.de.us/Departments/Planning/Zoning/documents/AdoptedCompPlan-Full_000.pdf

8.2.2 New Castle County¹²

The New Castle County portion of the Bay watershed includes the headwaters of several watersheds; such as the Elk River, Chesapeake and Delaware Canal, Bohemia River, the Sassafras River and the Upper Chester River. These headwaters constitute the smallest area of the Bay watershed within Delaware; however within the past several years they have experience some of the greatest residential growth. The community of Middletown, Delaware in southern New Castle County in the period from 2000 to 2008 increased its population by nearly 100%. However, this growth has not come without significant investment by Middletown and New Castle County for the expansion of sewer. New Castle County is a co-permittee, along with DeIDOT on Delaware's only MS4 permit. This process is described in Chapter 7.

Middletown and New Castle County have a shared goal to implement regional wastewater service for their respective jurisdictions and as a result as described in Table 26 both jurisdictions will offer regional wastewater treatment to the entire New Castle County portion of the watershed by 2025. In addition, to minimize the future growth of septic systems within areas identified as *Long Term Wastewater Expansion areas*, the County, through current land use policies, has established large lot subdivision requirements; such as 1 unit per 5 acres or 1 unit per 10 acres. In addition the County has passed ordinances that restrict the development of private utility wastewater treatment plants within the *Long Term Wastewater Expansion area*; again further limiting the number of future septic systems within the watershed. According to the 2011 proposed Comprehensive Plan for New Castle County, in lieu of public sanitary sewer, private sewer systems will be reviewed and approved. In areas where existing private onsite septic systems exist in proximity to public sewer, a community septic elimination program is in place to assist with conversion from private septic to public sewer at an average cost of \$25,000 per property. In addition New Castle County has committed as goals and objectives in its Comprehensive Plan to:

- Continue to provide efficient and cost effective sewer service in existing sewer district and to new users through expansion.
- Continually maintain and upgrade the existing sewer conveyance systems to ensure trouble-free operation.
- Continue to improve the efficiency of the existing sewer system by increasing the capacity through the reduction of inflow and infiltration of stormwater and illicit discharges into the sewer network.
- Continue to explore new technologies and techniques of wastewater treatment, disposal, and re-use.
- Continue and expand the County's "Septic Elimination Program" in order to assist communities with high percentages of failing septic systems to connect to the public sewer system.

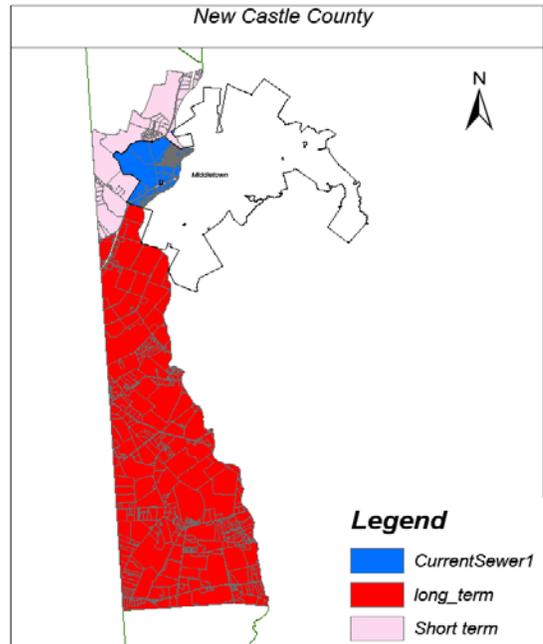


Figure 22: New Castle County Wastewater

¹² New Castle County Contact Information: Michael Harris, Environmental Compliance Manager. New Castle County Department of Special Services. Mharris@nccde.org. 302.395.5806.

Table 26: Residential Wastewater Type for New Castle County

EPA River Segment	2010 Land Use Scenario		2017 Land Use Scenario		2025 Land Use Scenario	
	Septic	Sewer	Septic	Sewer	Septic	Sewer
2981	23	0	0	33	0	43
2983	548	0	397	639	0	1354
3010	1618	0	1604	897	0	3375
3011	1062	0	1062	772	0	2126
3201	267	319	0	1194	0	1830
3361	89	0	0	354	0	586
3520	106	0	106	0	0	301
Total	3713	319	3169	3889	0	9615

Milestone Commitments

New Castle County recognizes the impact of its residents on local and regional water resources; as such the New Castle County is committed to improving water quality in local watersheds and ultimately the Chesapeake Bay. The County will continue to assist DNREC in meeting TMDL goals as established in pollution control strategies through consideration of actions such as limiting impervious cover, promoting low impact development approaches in new development and redevelopment, identifying areas where stormwater retrofits would effectively reduce sediment and nutrients, and requiring management of open space for nutrient reduction. New Castle County will continue to review and update relevant County codes and ordinances as described in the County's Comprehensive Plan to allow for and encourage protection and improvement of local water resources. The New Castle County Comprehensive Plan was updated in October 2011. The next update of the plan will be required in 2022. The County will continue to work with partners to address TMDLs in revisions to the County's Municipal Storm Sewer Systems (MS4) permit.

As Delaware and New Castle County work to implement the WIP in the future, activities may be coordinated with individual watershed organizations implementing Maryland's WIP. Specifically, we should consider coordinating with the SassafRAS Watershed Association and the Chester River Association as the headwaters for these waterways are located in New Castle County.

8.2.3 Sussex County¹³

The natural environment in Sussex County includes wetlands, waterways, beaches, upland forests, farmland, meadows and other opens space that supports a wide variety of plant and wildlife species of which about a third of all lands fall within the Chesapeake Bay watershed. The Sussex County portion of the Bay watershed includes the headwaters of several watersheds; such as the Upper Nanticoke River, the Middle Nanticoke River, Pocomoke River, and Wicomico River. The Chesapeake Bay Watershed within Delaware encompasses nearly half of Sussex County and contains 9 out of the 24 local municipalities including Ellendale, Georgetown, Greenwood, Bridgeville, Seaford, Blades, Laurel, Bethel, and Delmar.

Traditionally western Sussex County has been the State's leading agricultural producer. In addition to large farming regions, the County also encompasses small rural towns and growing population centers. Sussex County has faced significant development pressures in the last decade, primarily in the eastern side of the County, though many large developments have been proposed in the central and western parts of the county as well. As of 2011, approximately 25,000 residential lots have been recorded but not yet developed. This figure includes proposed development in incorporated and unincorporated areas of the county. The county has a five year sun-set period for approved but undeveloped parcels. In the Chesapeake Bay nutrient model, these lots may appear to be developed, however may revert or remain in agricultural uses or remain fallow due to current economic conditions.

The County has developed land use policies that support local growth within and around existing infrastructure, which primarily surrounds the nine municipalities. In addition to directing growth to areas with existing infrastructure, the County continues to partner with local, State and Federal partners to preserve agricultural and forest lands within the watershed. Finally to meet the requirements of the State's watershed implementation plan the County will need to further implement elements of it comprehensive land use plan to develop common sense ordinances that balance the County's strong property rights beliefs while meeting the needs of the resource; this may include revisions of ordinance for open space preservation, wetland and water protection, forest mitigation, etc.

Summary of Surface Water Management Needs

There are numerous entities responsible for surface water management in Sussex County, including state agencies (DNREC, DelDOT), the Sussex Conservation District, Sussex County, incorporated municipalities, tax ditch organizations, homeowners associations and non-profit groups. Stormwater management is a regulatory function with oversight provided by DNREC, but delegated to Sussex Conservation District. Drainage is a non-regulatory function. Sussex County government has limited involvement in surface water management issues.

An assessment of surface water management services in Sussex County was conducted to determine the current and projected needs of residents and the costs related to surface water management in Sussex County. The assessment evaluated twelve surface water management program elements including costs for managing storm water and drainage, tax ditch management and assistance, watershed modeling for both quantity and quality management, maintenance of and improvements to public infrastructures, maintenance and improvements to private infrastructure, source reduction strategies, flood plain protection

¹³ County Contact Information: County Administrator: Todd Lawson. tlawson@sussexcountyde.gov, 2 The Circle Georgetown, DE 19947. www.sussexcountyde.gov.

and improvement, dam safety, public outreach and public involvement, and planning and regulatory aspects. It was found that approximately \$10 million dollars is spent annually in Sussex County to manage surface waters; however an additional \$10 - \$20 million is needed annually, county-wide to adequately address surface water management. Specific needs identified included:

- Additional staff to provide post construction and annual maintenance inspections and technical assistance for stormwater management facilities.
- Implementation and technical assistance for property owners in regards to general drainage improvement projects, including large capital projects as well as minor maintenance needs, emergency response, etc.
- Technical and administrative assistance for tax ditch organizations within the state to assist in coordination of inspections and maintenance and implementation of best management practices.
- Development of small watershed models and studies for better water quality management from a whole system approach.
- Maintenance of and improvements to public infrastructure for local jurisdictions for stormwater management, including developing an inventory of stormwater assets for local communities. Restoration of aging stormwater infrastructure is a concern of local jurisdictions.
- In Delaware, there are many situations where private entities are responsible for maintenance of drainage systems; this may include tax ditch organizations or homeowner associations. This can create concerns about maintenance of these systems and ability to pay for infrastructure improvements. An inventory of privately owned/managed stormwater and drainage facilities and maintenance needs and schedules is needed. This will help us to account for retrofit needs and opportunities.
- Implementation of stormwater best management practices and retrofits to existing stormwater facilities in developed areas that have fallen into disrepair.
- Floodplain protection and improvement – Sussex County should consider revising development regulations to address development within the 100-year floodplain.
- Provide education and outreach through workshops and technical assistance to homeowners and property managers on stormwater facility management and maintenance, stormdrain marking, etc.
- Development of county drainage codes or a lines and grades ordinance and consideration of stormwater management and drainage in comprehensive planning.

Summary of Wastewater Activities

To address the need for wastewater service within the watershed, the local communities, Sussex County, the State, and the USDA Rural Development Program have developed a series of regional partnerships or provided significant investment to a local wastewater provider to enhance their local infrastructure to further remove failing septic systems from the watershed. These activities include:

- **Georgetown, Ellendale and the East New Market Sanitary Sewer District** – Wastewater is collected from the Town of Ellendale, the unincorporated Sussex County community of New Hope and portion of the Town of Georgetown within the watershed and is then treated at the Georgetown Wastewater facility and discharged outside of the Bay Watershed.
- **Bridgeville and Greenwood Combined Wastewater Treatment Facility** – Wastewater is collected from both Towns and is treated at the Bridgeville Wastewater Treatment Facility where it is discharged within the watershed. In 2009 the Town of Bridgeville was issued a wastewater spray irrigation permit, allowing Bridgeville to utilize treated effluent to irrigate a 64 acre farm, thus reducing Bridgeville's NPDES discharge to the Nanticoke River.
- **Seaford, Blades, and the Blades Sanitary Sewer District** – Wastewater is collected from the City of Seaford, the Town of Blades, and the unincorporated areas of Sussex County surrounding the Town of Blades and is treated at the Seaford Wastewater Treatment Facility where it is discharged within the watershed.
- **The Town of Laurel** - Wastewater is collected from within the Town and is treated at the Laurel Wastewater Treatment Facility where it is discharged within the watershed.
- **The Town of Bethel** – This historic community has no significant infrastructure and currently all homes within the community are served by individual septic systems.
- **The Town of Delmar** – Wastewater is collected from within the Town and is treated at the Delmar Treatment Facility where it is discharged within the watershed; however, outside of the State of Delaware.

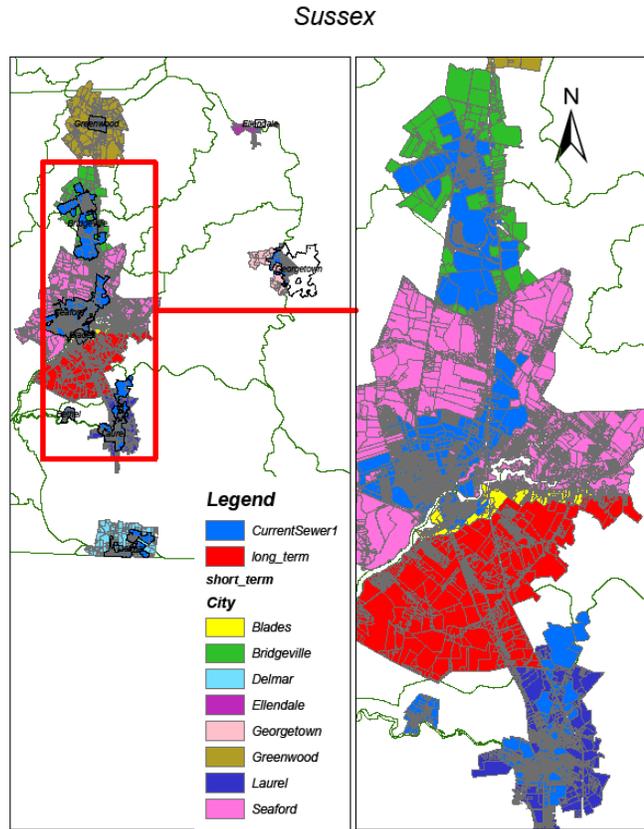


Figure 23: Sussex County Wastewater

A large portion of the County remains rural and relies on septic systems. The number of septic systems that are currently within the watershed and those projected for 2017 and 2025 can be seen in Table 27.

Table 27: Residential Wastewater Type for Sussex County

EPA River Segment	2010 Land Use Scenario		2017 Land Use Scenario		2025 Land Use Scenario	
	Septic	Sewer	Septic	Sewer	Septic	Sewer
4560 S	1401	462	1842	493	1802	919
4561	1146	0	1303	0	1417	0
4562	954	0	1003	256	989	720
4590 S	864	0	982	0	1121	0
4591	12	0	31	0	50	0
4594	278	0	369	0	455	0
4597	65	0	65	0	65	0
4630	7386	2025	7410	3715	7435	4560
4631	1258	0	1309	297	1297	762
4632	2901	220	3164	554	3151	1099
4633	6545	462	6444	1451	6428	2419
5110	814	0	959	0	1092	0
5400	210	540	219	555	228	540
Total	23,834	3,709	25,100	7,321	25,530	11,739

To reduce the number of on-site septic systems for the Sussex County portion of the watershed, the proposed reductions for those watershed segments with existing significant wastewater treatment infrastructure which may be expanded to allow for the removal of on-site septic systems is shown in Table 28.

Table 28: Proposed Percentage Reduction for New and Existing Septic Systems

EPA River Segment	2017 % Reduction	2025 % Reduction
4560 S	10	10
4562	15	15
4630	50	30
4631	40	30
4632	15	15
4633	20	20
5400	100	100

These proposed reductions in number of septic systems within the watershed can be seen in Table 29.

Table 29: Proposed Septic Systems Reductions for Sussex County:

EPA River Segment	2010 Land Use Scenario		2017 Land Use Scenario		2025 Land Use Scenario	
	Septic	Sewer	Septic	Sewer	Septic	Sewer
4560 S	1401	462	1657	678	1621	1100
4562	954	0	852	407	840	869
4630	7386	2025	3705	7420	5204	6791
4631	1258	0	785	821	907	1152
4632	2901	220	2689	1029	2678	1572
4633	6545	462	5155	2740	5142	3705
5400	210	540	0	774	0	768

These proposed reductions and their impacts within the total watershed can be seen in Table 30.

Table 30: Revised Residential Wastewater Type for Sussex County with Proposed Reduction applied

EPA River Segment	2010 Land Use Scenario		2017 Land Use Scenario		2025 Land Use Scenario	
	Septic	Sewer	Septic	Sewer	Septic	Sewer
4560 S	1401	462	1657	678	1621	1100
4561	1146	0	1303	0	1417	0
4562	954	0	852	407	840	869
4590 S	864	0	982	0	1121	0
4591	12	0	31	0	50	0
4594	278	0	369	0	455	0
4597	65	0	65	0	65	0
4630	7386	2025	3705	7420	5204	6791
4631	1258	0	785	821	907	1152
4632	2901	220	2689	1029	2678	1572
4633	6545	462	5155	2740	5142	3705
5110	814	0	959	0	1092	0
5400	210	540	0	774	0	768
Total	23834	3709	18552	13839	20592	15957

By expanding regional and local wastewater treatment facilities in Sussex County in accordance with current plans, the number of individual onsite septic systems expected to be reduced for the period of 2010 through 2017 or during the **Short Term Wastewater Expansion** is 6,548. An additional 4,938 individual

onsite septic systems will be eliminated between 2017 and 2025 or as part of the **Long Term Wastewater Expansion**. These numbers will be further refined during the Master Planning Process using the CommunityViz model to reflect revisions to the population projections and further land preservation activities. In addition, all partners and the Federal, State, County and local levels will continue to evaluate potential funding sources to meet onsite septic elimination goals.

Milestone Commitments

Sussex County recognizes the impact of its residents on local and regional water resources; as such Sussex County is committed to improving water quality in local watersheds and ultimately the Chesapeake Bay. As described in the County's long term capital improvements plan, the County will continue expansion of wastewater treatment service to county residents within the County's growth areas to remove failing onsite septic systems particularly in and around sewer districts in the Blades and Ellendale sewer districts. The County anticipates extending central sewer to 37 existing residences near Blades by 2013.

The County will continue to review and update relevant codes and ordinances as necessary as described in their Comprehensive Plan. The Sussex County Comprehensive Plan was approved in October 2008. A review of the Comprehensive Plan will be completed by October 2013. The next update of the Comprehensive Plan is due by October 2018.

The Department of the Office of State Planning and Coordination along with local governments will engage Sussex County in Master Planning Process to further refine short and long term wastewater and septic goals, as well as long term growth projections. The Office of State Planning and Coordination will also coordinate with Sussex County a review of approved development projects within the last five years to determine which projects may sun-set. This information will be provided to EPA's Chesapeake Bay Program to be considered in future nutrient loading calculations for Delaware's TMDL allocation.

Tetra Tech has provided Sussex County with a review of their local ordinances along with a set of recommendations for the County to consider as they review and update their ordinances. Tetra Tech has also provided model ordinances for the County's consideration. The recommendations and model ordinances provided to Sussex County are available in Appendix K and L.

8.2.4 Bethel¹⁴

The Town of Bethel is located in Sussex County Delaware, a few miles west of the Town of Laurel. Bethel is situated in a largely agricultural area along Broad Creek and is now recognized as a destination on the Captain John Smith Chesapeake Bay National Historic Water Trail. It is also located on the Western Sussex County Historic Byway. In 1975, the whole town of Bethel was placed on the National Historic Register in view of its rich history in the maritime industry during the 1800's.

The population of Bethel is 171 (2010 Census). The town boundaries contain 170 parcels totaling 300 acres (2006, Town of Bethel Land Use Survey). The most common use of land is residential, followed next by agricultural/natural resources/open space. It is interesting to note that the natural resources/open space parcels are only 17% of the total parcels in town, but are 66% of the total land. In contrast, residential uses are 75% of the total parcels in Town, but only 27% of the total land within Town limits.

Nearly all the land uses adjacent to the community are rural in nature. Most of the lands to the east, north and west are used for agricultural purposes, while the southern portion of the Town is bordered by Broad Creek. Lands to the south of Town are mostly residential, composed of a mix of single family homes, a major subdivision named Broad Creek Estates, and state wildlife management lands.

All of the lands surrounding the Town are within the jurisdiction of Sussex County and are zoned Agriculture/Residential 1 (AR-1). This zoning classification allows agricultural use and residential use on lots as small as a half-acre depending on subdivision size and the types of public utilities available. However, both the Sussex County Comprehensive Plan and the Strategies for State Policies and Spending designate the area surrounding Bethel as a predominately rural area. Because of this designation, no new major infrastructure improvements are proposed at this time by the state or county.

Development activity in and around Bethel is minimal. Residents of the Town rely on independent wells and stand alone septic systems; the Town does not provide municipal water or sewer service. However the town has identified the need within its current comprehensive plan to communicate with Sussex County regarding the potential for future expansion of sewer service to the Bethel area. Additionally the town has also expressed interest in evaluating stormwater management problems within the town boundaries with regards to drainage directly into the Broad Creek and adjacent wetlands.

Milestone Commitments

The Town of Bethel recognizes the impact of its residents on local and regional water resources; as such the Town of Bethel is committed to improving water quality in the Broad Creek and its tributaries and ultimately the Chesapeake Bay. The Town will continue to review and update as necessary relevant codes and ordinances as described in Bethel's Comprehensive Plan to allow for and encourage protection and improvement of local water resources and remove barriers for implementing acceptable practices. Bethel's Comprehensive Plan will be updated in 2018. The Town is in the process of reviewing and updating its landuse and zoning code.

The Town of Bethel, along with the Delaware Center for Horticulture, in coordination with the Department has submitted grant proposals to address green infrastructure improvements within the Town. DNREC

¹⁴ Bethel Contact Information: Councilwoman: Kathy Layfield, Telephone: (302) 875-1906, Email: tob310bethel@gmail.com

intends to provide assistance to Bethel in coordinating future grant applications for green infrastructure improvements.

The Department and the Office of State Planning Coordination through a partnership with the University of Delaware Sustainable Communities Initiative will engage the Town of Bethel, along with the Town of Laurel and Sussex County in a master planning process to consider future growth, along with wastewater needs and options. This process will likely occur in 2013.

Tetra Tech has provided the Town of Bethel with a review of their local ordinances along with a set of recommendations for the Town to consider as they review and update their ordinances. Tetra Tech has also provided model ordinances for the Town's consideration. The recommendations and model ordinances provided to Bethel are available in Appendix K and L.

The Restoration Subcommittee has completed an analysis on the percent of tree canopy existing within a 100 foot riparian area in each of the municipalities within the Chesapeake. Table 42 in Section 10 provides a breakdown of the canopy acres in each municipality.

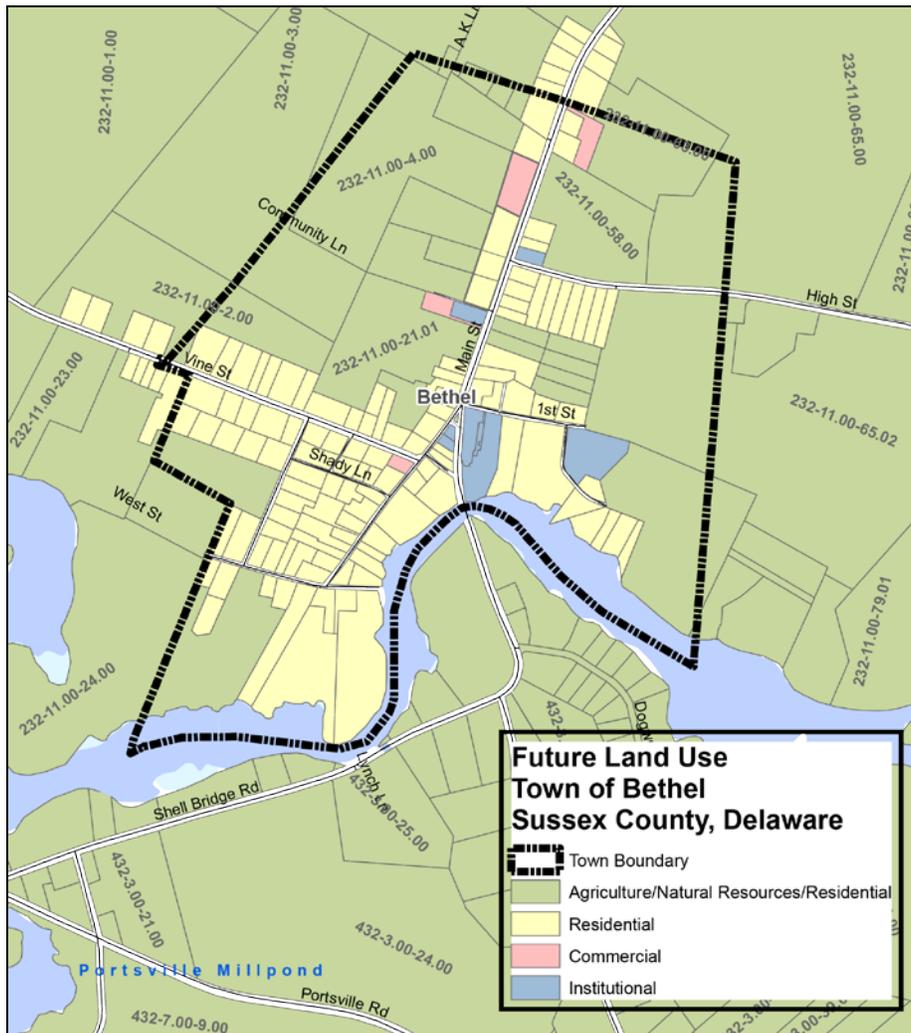


Figure 24: Future Land Use for the Town of Bethel

8.2.5 Blades¹⁵

The Town of Blades is located in Sussex County Delaware along the banks of the Nanticoke River. The population of Blades is approximately 1,000 residents. The river is the most significant environmental feature in the town. There are approximately 3,800 linear feet of shoreline along the Nanticoke River. Development along the Nanticoke is mixed. The marina and the Marina District account for the most intensive development along the riverfront. Low-density residential uses account for the remaining existing development for those areas immediately adjacent to the Nanticoke and associated wetlands.

The Town of Blades does not operate its own wastewater-treatment facility, but is part of Sussex County's Blades Sanitary Sewer District, created in the late 1970s. The original boundaries of this district were the limits of the Town of Blades. The County installed the sewer-collection and -transmission infrastructure, but decided to enter into an agreement with the City of Seaford to treat the waste from the district, rather than construct a freestanding treatment plant for Blades. The original agreement with Seaford limited the district to a flow of approximately 80,000 gallons per day (gpd), and contained provisions limiting the type and intensity of wastes to be treated by the plant. The Blades District has been expanded to include areas that have been annexed into Blades and is currently contiguous with the town boundaries. Sussex County, on behalf of Blades and the City of Seaford, has updated the agreement and wastewater-flow allocations.

Blades is currently allocated a maximum flow of 120,000 gpd. The Blades district is currently operating at an average of approximately 103,664 gpd, an increase to the maximum being considered. The current allocation of 120,000 gpd will allow only 17,000 gpd for growth in Blades. This is only enough capacity for approximately 60 new homes, and much of this extra capacity could be used by new commercial or industrial users. Blades' records indicate the average household pumps only 200 gpd. Sanitary-sewer capacity is the most limiting factor in Blades' growth. This situation is complicated by the fact that Blades has little direct control over the provision of wastewater capacity for the town. Blades, the City of Seaford and Sussex County have a sewer district agreement that provides for the accommodation of increased flows beyond the stated 120,000 gpd allocation. This would allow the Town of Blades and or Sussex County to continue to accommodate growth and to eliminate failing septic systems to meet the goals of the WIP. Blades, Seaford and Sussex County also collaborate regularly to plan for and address development pressures and growth concerns.

Milestone Commitments

The Town of Blades recognizes the impact of its residents on local and regional water resources; as such the Town of Blades is committed to improving water quality in the Nanticoke River and its tributaries and ultimately the Chesapeake Bay. The Town's Comprehensive Plan will be updated in 2018. The Town will continue to review and update as necessary any relevant codes and ordinances as described in Blades' Comprehensive Plan to allow for and encourage protection and improvement of local water resources and remove barriers for implementing acceptable practices. Tetra Tech has provided the Town of Bethel with a review of their local ordinances along with a set of recommendations for the Town to consider as they review and update their ordinances. Tetra Tech has also provided model ordinances for the Town's consideration. The recommendations and model ordinances provided to Bethel are available in Appendix K and L.

¹⁵ Blades Contact Information: Town Administrator: Vikki Prettyman, vikkiprettyman@bladesde.com. 20 W. Fourth Street Blades, Delaware 19973, www.bladesde.com.

Blades Town Council recently passed a resolution approving to increase their tree canopy from 27.15% to 30% over the next 10 years. They are also moving forward with a Tree-City USA designation and planted trees on November 2nd, 2011 at the school and around town with the Delaware Forestry Service. The Restoration Subcommittee has completed an analysis on the percent of tree canopy existing within a 100 foot riparian area in each of the municipalities within the Chesapeake. Table 42 in Section 10 provides a breakdown of the canopy acres in each municipality. The Department is committed to providing assistance to the Town of Blades in development of green infrastructure improvements within the Town and is willing to assist in coordinating future grant applications for green infrastructure improvements.

The Department and the Office of State Planning Coordination through a partnership with the University of Delaware Sustainable Communities Initiative will engage the Town of Blades, along with the City of Seaford and Sussex County in a master planning process that focuses on water resource protection for use in future comprehensive planning exercises and updates over the next several years. This process will likely occur in 2014.

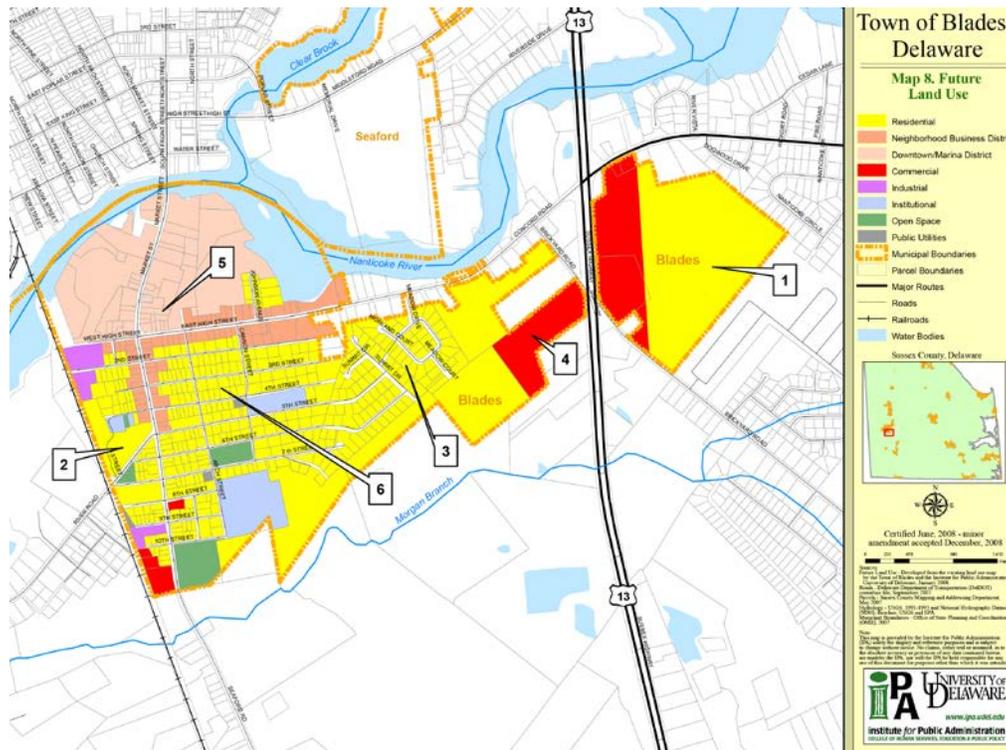


Figure 25: Future land use for the Town of Blades

8.2.6 Bridgeville¹⁶

Background

The Town of Bridgeville experienced steady growth in between 2005 and 2010. Bridgeville provides municipal sewer service to its residents as well as residents of the nearby Town of Greenwood. The town currently has the capacity to treat 600,000 gallons of effluent per day. The current treatment plant infrastructure was built in 1964, but was recently upgraded with two new Rotating Biological Reactors. The town utilizes spray irrigation to dispose of its wastewater approximately eight months out of the year and discharges to a local stream approximately four months of the year. The Town's current NPDES permit expired as of December 2011 and has been administratively extended. A new permit is expected in 2012.

Milestone Commitments

The Town of Bridgeville recognizes the impact of its residents on local and regional water resources; as such the Town of Bridgeville is committed to improving water quality in the Nanticoke River and its tributaries and ultimately the Chesapeake Bay. The Town will continue to operate and upgrade the Bridgeville Municipal Wastewater Treatment Plant in accordance with NPDES permit requirements. The Town's NPDES Permit is expected to be renewed in 2012. The Town has committed to evaluate future infrastructure needs and wastewater treatment options in 2012 to bring the plant into compliance with the WIP and Chesapeake Bay TMDL through the development of a new water and wastewater facilities plan. A compliance schedule will be incorporated into the Town's NPDES permit.

Additionally, the Town is working with the Office of State Planning Coordination, the University of Delaware Sustainable Communities Initiative, the Department, the Town of Greenwood, and Sussex County in 2012 to develop a realistic growth plan for services. The plan will be focused on water resource protection for use in future comprehensive planning exercises and updates over the next several years and will be developed through a Master Planning process using the Delaware Land Use and Growth model.

Finally the Town of Bridgeville will continue to review and update as necessary relevant codes and ordinances as described in Bridgeville's Comprehensive Plan to allow for and encourage protection and improvement of local water resources and remove barriers for implementing acceptable practices. The Town's Comprehensive Plan will be updated in 2021. Tetra Tech has provided the Town with a review of their local ordinances along with a set of recommendations for consideration as they review and update ordinances. Tetra Tech has also provided model ordinances for the Town's consideration. The recommendations and model ordinances are available in Appendix K and L.

The Restoration Subcommittee has completed an analysis on the percent of tree canopy existing within a 100 foot riparian area in each of the municipalities within the Chesapeake. Table 42 in Section 10 provides a breakdown of the canopy acres in each municipality.

¹⁶ Bridgeville Contact Information: Town Manager 101 N Main Street, Bridgeville, DE 19933, <http://www.townofbridgeville.net/>.

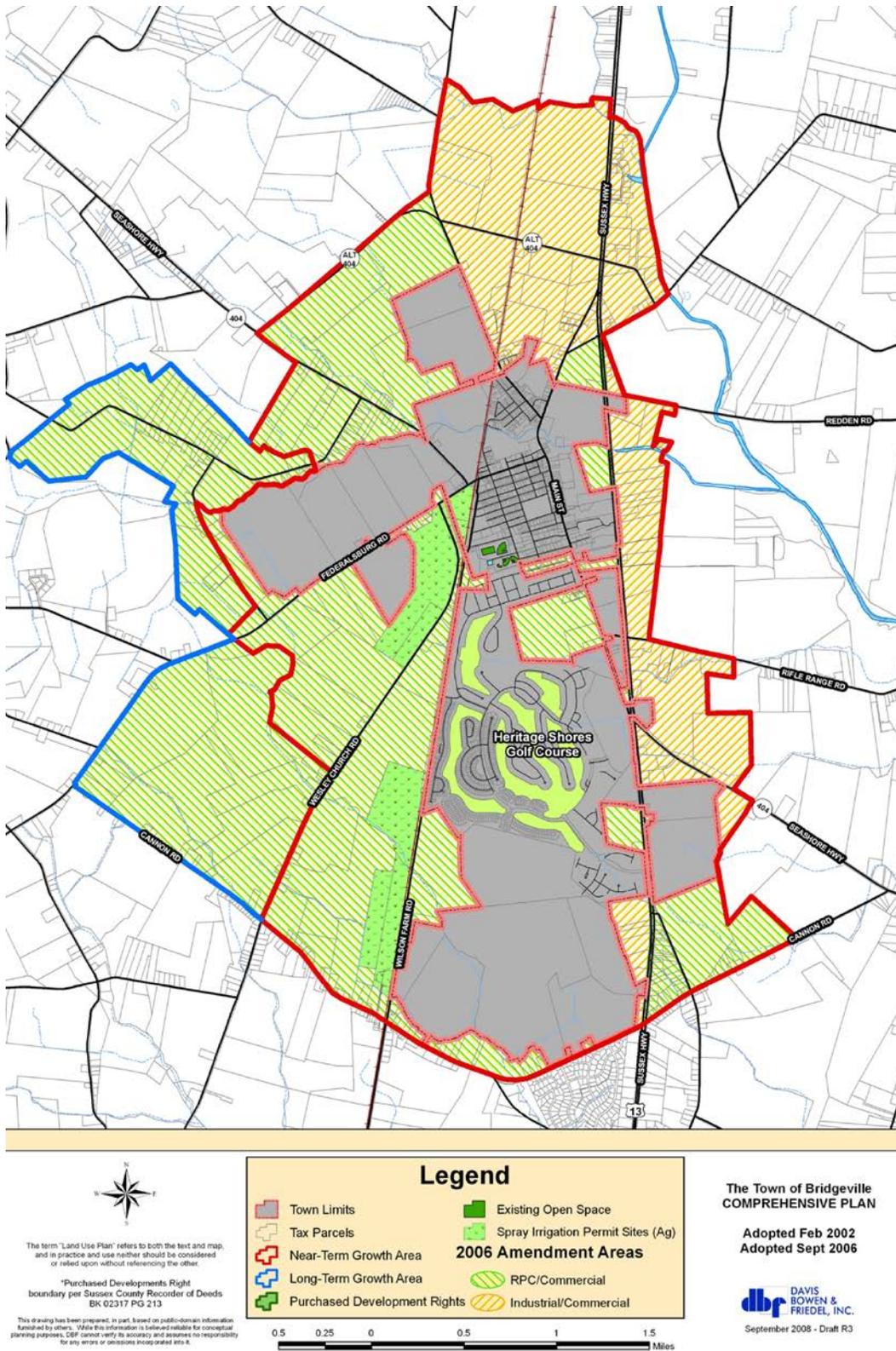


Figure 26: Future land use for the Town of Bridgeville

8.2.7 Delmar¹⁷

Background

The Town of Delmar is located in Sussex County at the Delaware/Maryland state line in the Wicomico River Watershed. As of 2010 the town supports a population of 1,487 on the Delaware side of the town. The Town provides water and municipal sewer to its residents. Additional information from 2011 Comprehensive Plan (population, growth trends, challenges, etc).

The Town of Delmar provides municipal wastewater treatment service to its residents, however treatment is provided by a treatment plant located in Delmar, Maryland.

As part of the Town's 2010 comprehensive land use plan update, the Town seeks to preserve and protect existing and new development which will achieve the preservation of historic sites, retain open space, and conserve natural areas that will create and provide a sense of community continuity and grace. To implement this vision, the Town has developed a short-term and long-term plan for annexations that included the revision of local codes and regulations and has developed a plan for short-term and long-term waste water treatment and disposal.

Milestone Accomplishments and Activities

The Town of Delmar recognizes the impact of its residents on local and regional water resources; as such the Town of Delmar is committed to improving water quality in the Wicomico River and its tributaries and ultimately the Chesapeake Bay. The Town of Delmar will continue to extend wastewater treatment services to local residents within the town's long-term growth and annexation areas to remove failing onsite septic systems as funding is available. Residents of Delmar, including those in Delaware, pay a flat rate "flush tax" to help finance future upgrades for its wastewater treatment system, which is located in Maryland.

The town of Delmar will continue to review and update as necessary any relevant codes and ordinances as described in Delmar's Comprehensive Plan to allow for and encourage protection and improvement of local water resources and remove barriers for implementing acceptable practices. The Town's Comprehensive Plan will be updated in 2021. Tetra Tech has provided the Town with a review of their local ordinances along with a set of recommendations for consideration as they review and update ordinances. Tetra Tech has also provided model ordinances for the Town's consideration. The recommendations and model ordinances are available in Appendix K and L. The Department and the Office of State Planning Coordination through a partnership with the University of Delaware Sustainable Communities Initiative will engage the Town and Sussex County in a master planning process that focuses on water resource protection for use in future comprehensive planning exercises and updates over the next several years. This process will likely occur in 2014.

The Restoration Subcommittee has completed an analysis on the percent of tree canopy existing within a 100 foot riparian area in each of the municipalities within the Chesapeake. Table 42 in Section 10 provides a breakdown of the canopy acres in each municipality.

¹⁷ Delmar Contact Information: Town Manager, Sara Bynum-King; townmgr.delmar@verizon.net. 100 S. Pennsylvania Avenue Delmar, MD 21875. www.townofdelmar.us

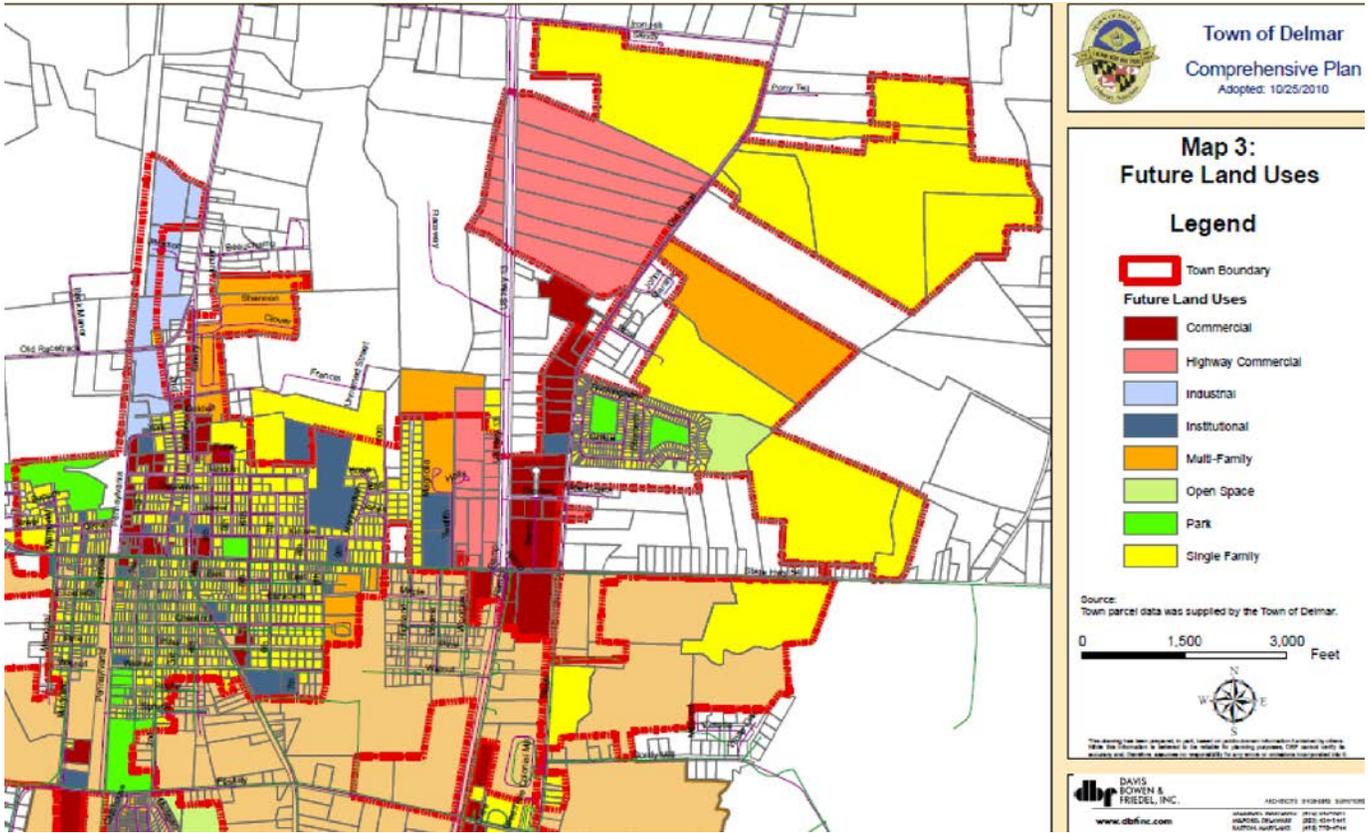


Figure 27: Future land use for the Town of Delmar

8.2.8 Ellendale¹⁸

Background

The small rural Town of Ellendale is located in Sussex County Delaware. The town is actually located in the Broadkill River Watershed; however the long term annexation area on the west side of Route 113 is located in the headwaters of Nanticoke River Watershed. The Town of Ellendale does not operate its own wastewater-treatment facility.

Milestone Commitments

The Town of Ellendale recognizes the impact of its residents on local and regional water resources; as such the Town of Ellendale is committed to improving water quality in the Nanticoke River and its tributaries and ultimately the Chesapeake Bay. The Town will continue to review and update as necessary any relevant codes and ordinances as described in Ellendale's Comprehensive Plan to allow for and encourage protection and improvement of local water resources and remove barriers for implementing acceptable practices. The town's Comprehensive Plan will be updated in 2019. Tetra Tech has provided the Town with a review of their local ordinances along with a set of recommendations for consideration as they review and update ordinances. Tetra Tech has also provided model ordinances for the Town's consideration. The recommendations and model ordinances are available in Appendix K and L. The Department and the Office of State Planning Coordination through a partnership with the University of Delaware Sustainable Communities Initiative will engage the Town and Sussex County in a master planning process that focuses on water resource protection for use in future comprehensive planning exercises and updates over the next several years. This process will likely occur in 2014.

The Restoration Subcommittee has completed an analysis on the percent of tree canopy existing within a 100 foot riparian area in each of the municipalities within the Chesapeake. Table 42 in Section 10 provides a breakdown of the canopy acres in each municipality.

¹⁸ Ellendale Contact Information: Mayor: Delores Price, 300 McCauley Avenue, Ellendale, DE 19941, 302-422-6727, ellendaletown@comcast.net

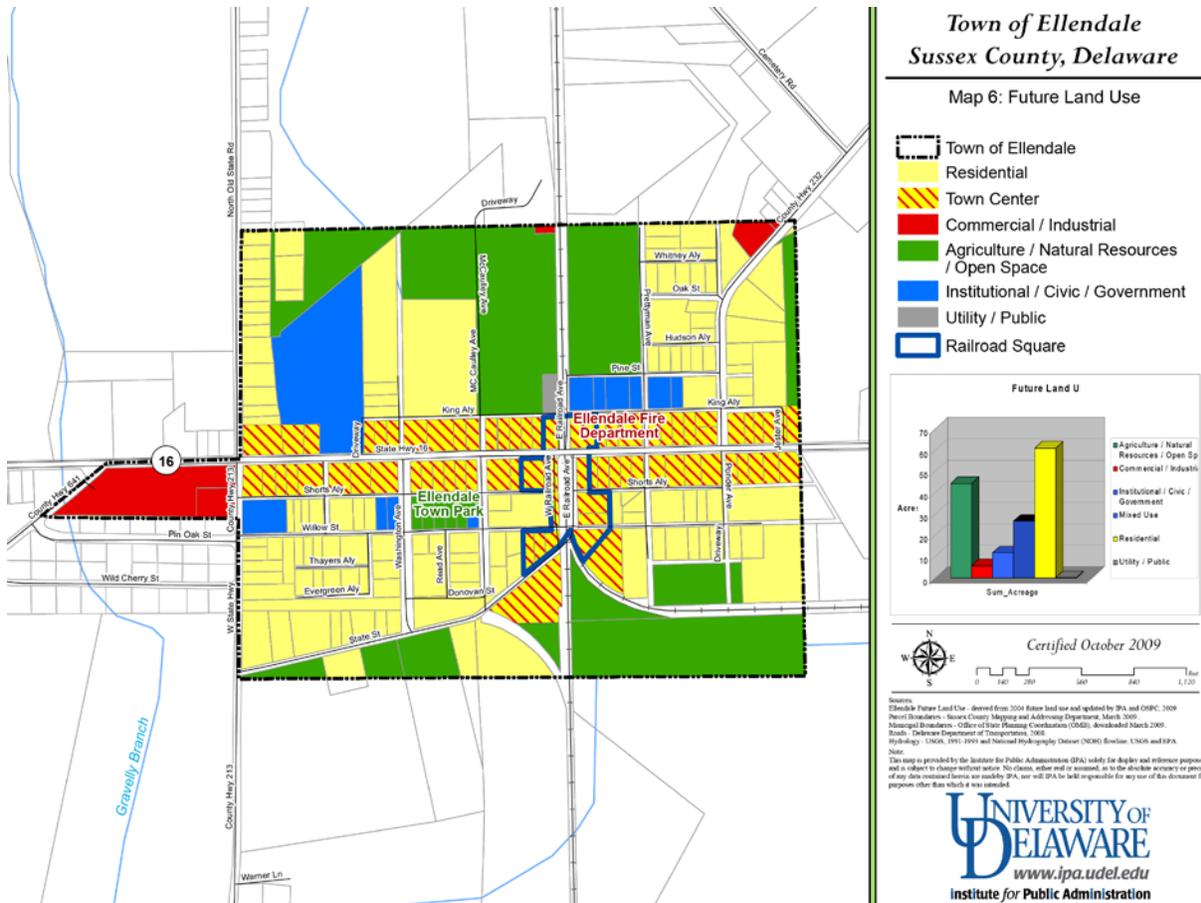


Figure 28: Future land use for the Town of Ellendale

8.2.9 Georgetown¹⁹

Background

The rural Town of Georgetown is located in Sussex County Delaware. The Town sits in a unique location, at the headwaters of three different watersheds. The western portion of the town that falls within the headwaters of the Nanticoke Watershed is rural and predominantly part of the Town's long term growth strategy. The Town operates a wastewater treatment facility located on Cedar Lane, located in the Inland Bays Watershed. Treated effluent is disposed of via spray irrigation. All new projects are required to tie into the Town's existing conveyance lines for treatment at our facility. The soils and poor drainage within this area are a challenge for new growth to overcome.

Milestone Commitment

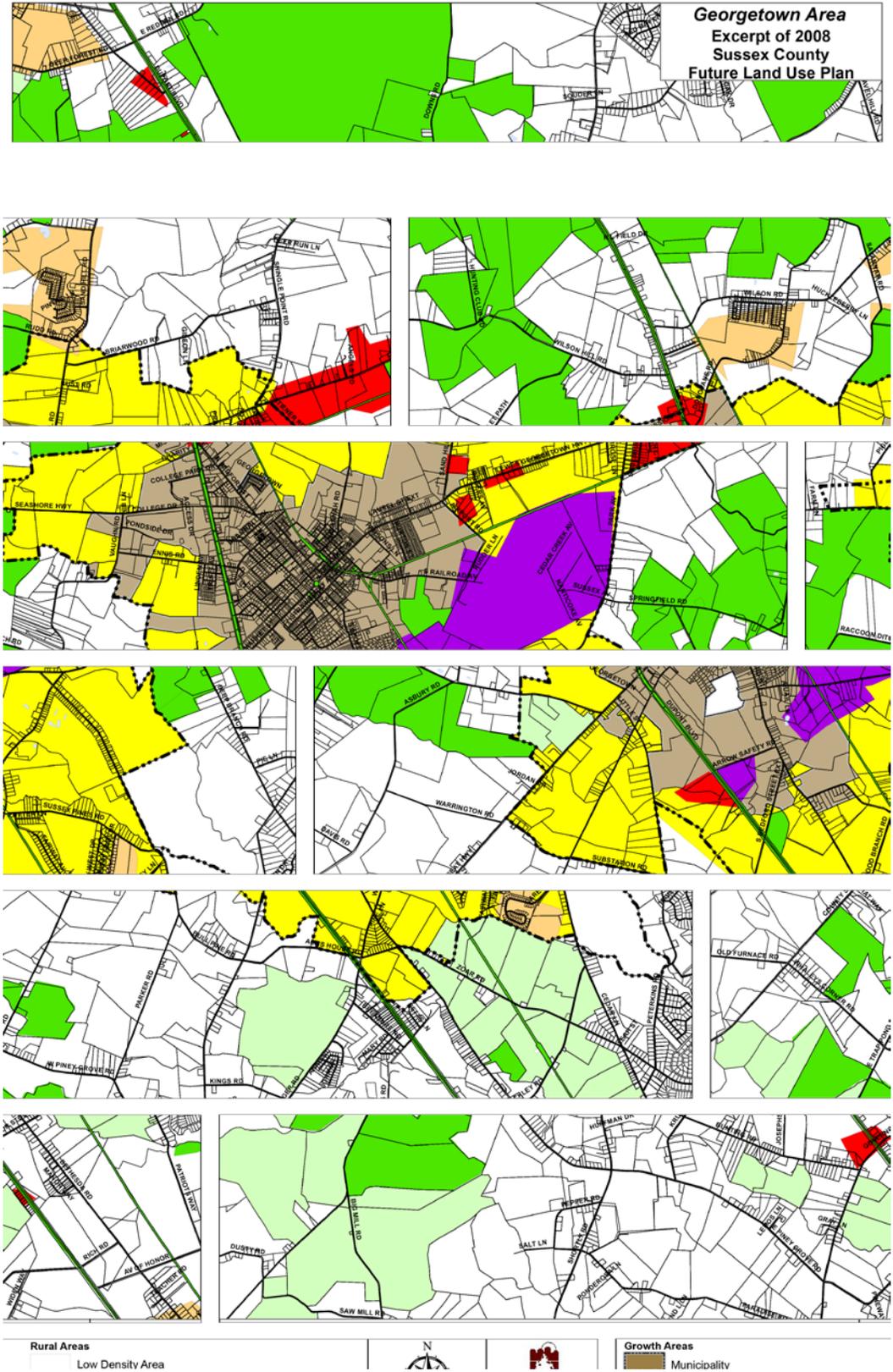
The Town of Georgetown recognizes the impact of its residents on local and regional water resources; as such the Town of Georgetown is committed to improving water quality in the Nanticoke River and its tributaries and ultimately the Chesapeake Bay. The Town of Georgetown will continue to extend wastewater treatment service to local residents within the town's long-term growth and annexation areas to remove failing onsite septic systems as funding is available.

Georgetown will also continue to review and update as necessary any relevant codes and ordinances as described in Georgetown's Comprehensive Plan to allow for and encourage protection and improvement of local water resources and remove barriers for implementing acceptable practices. The Town of Georgetown recently completed a Master Planning exercise in 2011 which provided detailed information on future growth as related to the expansion of the local airport. The exercise also included a look at potential water resource issues. Georgetown's Comprehensive Plan will be updated in 2019.

The town of Georgetown cooperates with the Department and partners in outreach and education opportunities related to protection of water resources for residents within the community. The Town has implemented storm drain marking throughout the town, regularly sweeps streets, and has implemented an urban tree planting program. The Restoration Subcommittee has completed an analysis on the percent of tree canopy existing within a 100 foot riparian area in each of the municipalities within the Chesapeake. Table 42 in Section 10 provides a breakdown of the canopy acres in each municipality.

Tetra Tech has provided the Town of Georgetown with a review of their local ordinances along with a set of recommendations for the Town to consider as they review and update their ordinances. Tetra Tech has also provided model ordinances for the Town's consideration. The recommendations and model ordinances provided to Georgetown are available in Appendix K and L.

¹⁹ Georgetown Contact Information: Town Manager: Gene Dvornick, GDvornick@georgetowndel.com. 39 The Circle Georgetown, DE 19947.



8.2.10 Greenwood²⁰

Background

The small rural Town of Greenwood is located in Sussex County Delaware in the headwaters of the Nanticoke River Watershed. The Town of Greenwood does not operate its own wastewater-treatment facility, but is currently part of the Bridgeville Sanitary Sewer District. The current infrastructure is dated and has significant inflow and infiltration challenges. Growth within the town of Greenwood is limited by Bridgeville's wastewater treatment allocation to the Town of Greenwood. A new high school will be built within the Town's boundaries, further complicating the wastewater issue.

Milestone Commitments

The Town of Greenwood recognizes the impact of its residents on local and regional water resources; as such the Town of Greenwood is committed to improving water quality in the Nanticoke River and its tributaries and ultimately the Chesapeake Bay. The Town will continue to review and update as necessary relevant codes and ordinances as described in Greenwood's Comprehensive Plan to allow for and encourage protection and improvement of local water resources and remove barriers for implementing acceptable practices. The Town's Comprehensive Plan will be updated in 2018. Tetra Tech has provided the Town with a review of their local ordinances along with a set of recommendations for consideration as they review and update ordinances. Tetra Tech has also provided model ordinances for the Town's consideration. The recommendations and model ordinances are available in Appendix K and L.

The Town of Greenwood is participating in a Master Plan exercise with the Town of Bridgeville and Sussex County for the Bridgeville Sewer District that focuses on future water infrastructure needs and will assist the town in future growth plans. The Department and the Office of State Planning Coordination through a partnership with the University of Delaware Sustainable Communities Initiative will engage the Towns and Sussex County in a master planning process that focuses on water resource protection for use in future comprehensive planning exercises and updates over the next several years. The Town of Greenwood is evaluating current wastewater treatment options, including the potential to develop its own water treatment facility. Funding will be needed by the town to address wastewater treatment needs in the future.

The Landuse Subcommittee is committed to providing grant writing assistance to the Town to address green infrastructure improvements within the Town's boundaries. DNREC and OSPC have identified a potential demonstration project within the center of Town. The Town will seek grant funding through the National Fish and Wildlife Foundation and/or other sources to implement this project which will address nutrients and sediments from an extensive area.

The Restoration Subcommittee has completed an analysis on the percent of tree canopy existing within a 100 foot riparian area in each of the municipalities within the Chesapeake. Table 42 in Section 10 provides a breakdown of the canopy acres in each municipality.

²⁰ Greenwood Contact Information: Town Manager: John McDonnell, jmcdonnell@townofgreenwood.us. 100 W. Market Street P.O. Box 216 Greenwood, DE 19950. www.greenwood.delaware.gov

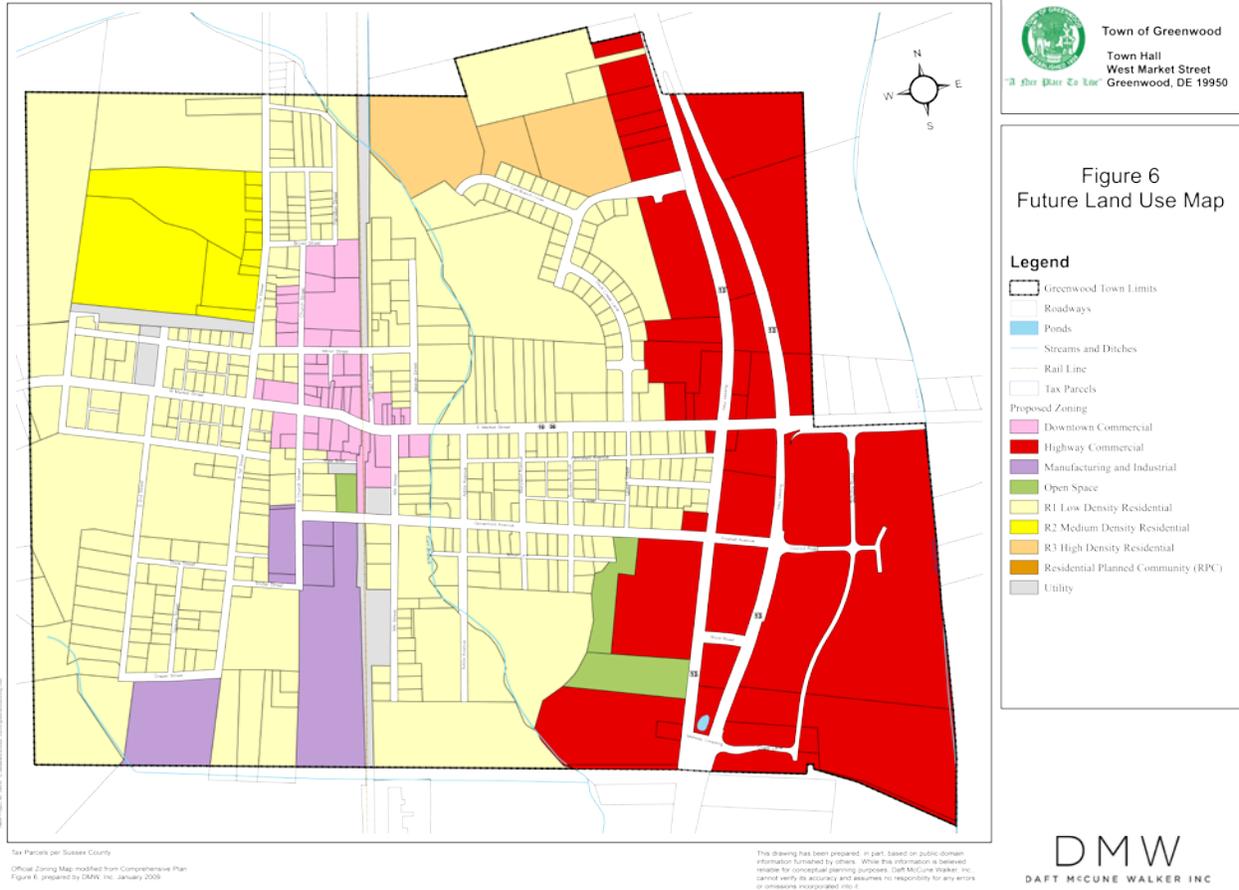


Figure 30: Future land use map for the Town of Greenwood

8.2.11 Laurel²¹

Background

As community and business center in southwestern Delaware, Laurel occupies a strategic position. It is a Nanticoke River and Broad Creek community and it is equally a U.S. Route 13 community. The Town is located in a major growth area of Sussex County and the Delmarva Peninsula with community and business relationships with Seaford, Georgetown, Delmar, Dover and Salisbury that is rich in agriculture and forestry activities.

The Town of Laurel provides municipal wastewater treatment service to its residents. The system was upgraded in 2007 to expand its flow capacity to 700,000 gallons per day (0.7mgd) and upgrade treatment technology to BNR (Biological Nutrient Removal). Treated effluent is permitted to be discharged into the Broad Creek. The system currently (2011) provides service to 1,561 customers and is using approximately 50% of permitted flow capacity. The town anticipates that at current growth and usage rates they have approximately 8- 12 years of growth capacity within their current system. The town may consider incorporation of spray irrigation and/or Rapid Infiltration Basin technologies in future expansion studies.

Laurel currently has the capacity to extend sewer services to areas within its annexation areas however challenges have been identified. Some neighborhoods that are eligible for annexation are not interested in annexing into the Town of Laurel due to the cost of connection to public utilities, cost of utilities and the additional tax burden associated with being "in-town". Also the town is concerned that providing services to existing development may limit the opportunity for future growth due to the cost of technology and improvements to further expand their treatment capabilities in the future.

Milestone Commitments

The Town of Laurel recognizes the impact of its residents on local and regional water resources; as such the Town of Laurel is committed to improving water quality in the Nanticoke River and its tributaries and ultimately the Chesapeake Bay. The Town will continue to extend wastewater treatment services to local residents within the town's long-term growth and annexation areas to remove failing onsite septic systems as funding and opportunities become available. Laurel will continue to operate its Municipal Wastewater Treatment Plant in accordance with NPDES permit limits and incorporate new technology as improvements are needed to accommodate future growth. The Town's NPDES permit will be updated by May 2014. The Town of Laurel is currently working on a two phase corridor improvement project along Route 13 which will extend sewer service to 26 existing residences and 10 commercial properties, removing the equivalent of 212 EDUs from onsite septic systems. This project will be phased in starting in late 2011 and is expected to take approximately 18 months. The cost of this project is \$6 million. Funding for this project is provided by USDA - RD.

The Town of Laurel will continue to review and update as necessary relevant codes and ordinances as described in Laurel's Comprehensive Plan to allow for and encourage protection and improvement of local water resources and remove barriers for implementing acceptable practices. The Town's Comprehensive Plan will be updated in 2021. The Town of Laurel updated its comprehensive plan in 2011. The town included a specific section and detail on how it intends to address water-quality issues and the TMDL. The town has identified several strategies that will help meet water-quality goals, including increasing its tree

²¹ Laurel Contact Information: Operations Manager: Jamie Smith, Town Hall, 201 Mechanic Street, 302-875-2277, laurelop@comcast.net, www.townoflaurel.net

canopy and adopting protective ordinances such as riparian buffers, land conservation, and limiting floodplain development. Tetra Tech has provided the Town with a review of their local ordinances along with a set of recommendations for consideration as they review and update ordinances. Tetra Tech has also provided model ordinances for the Town's consideration. The recommendations and model ordinances are available in Appendix K and L.

The Town will consider working with the Department and the Office of State Planning Coordination through a partnership with the University of Delaware Sustainable Communities Initiative along with the Town of Bethel and Sussex County in a master planning process that focuses on water resource protection for use in future comprehensive planning exercises and updates over the next several years.

The Landuse Subcommittee is committed to providing grant writing assistance to the Town to address green infrastructure improvements within the Town's boundaries, with special focus on three new schools to be built in the community. The subcommittee intends to work with the Town to seek grant funding through the National Fish and Wildlife Foundation and/or other sources to provide green infrastructure improvements which will address nutrients and sediments from an extensive area.

The Restoration Subcommittee has completed an analysis on the percent of tree canopy existing within a 100 foot riparian area in each of the municipalities within the Chesapeake. Table 42 in Section 10 provides a breakdown of the canopy acres in each municipality.

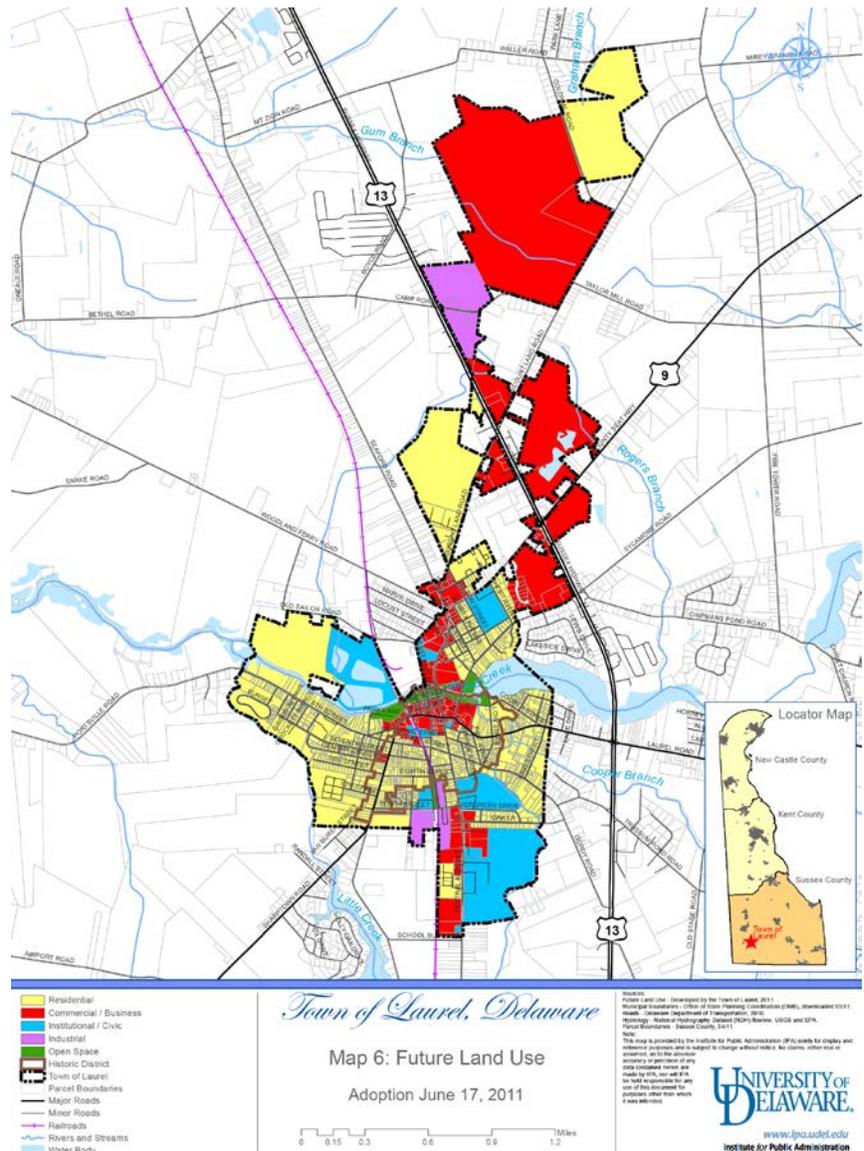


Figure 31: Future land use change for the Town of Laurel

8.2.12 Middletown²²

Background

Middletown is located in New Castle County Delaware. The Town sits at the headwaters of two different watersheds, the Appoquinimink which drains to the Delaware and the Bohemia River Watersheds which drains to the Chesapeake. The western portion of the town that falls within the headwaters of the Bohemia is rural and predominantly part of the Town's long term growth strategy. In 2008 a master plan for the area was developed. The Town of Middletown provides municipal wastewater-treatment to its residents and relies on spray irrigation system, which is located in the Appoquinimink Watershed. The Town is also delegated by the DNREC to review, approve, and manage stormwater systems within its jurisdiction.

Milestone Accomplishments and Activities

The Town of Middletown recognizes the impact of its residents on local and regional water resources; as such the Town of Middletown is committed to improving water quality in the Bohemia River and ultimately the Chesapeake Bay. The Town of Middletown completed a Master Planning exercise in 2008 which provided detailed information on future growth. The Town's Comprehensive Plan will be updated in 2019.

Middletown will continue to extend wastewater treatment service to local residents within the town's long-term growth and annexation areas to remove failing onsite septic systems as funding and opportunities become available. The Town will also continue to review and update as necessary relevant codes and ordinances as described in Middletown's Comprehensive Plan to allow for and encourage protection and improvement of local water resources and remove barriers for implementing acceptable practices.

The Restoration Subcommittee has completed an analysis on the percent of tree canopy existing within a 100 foot riparian area in each of the municipalities within the Chesapeake. Table 42 in Section 10 provides a breakdown of the canopy acres in each municipality.

²² Middletown Contact Information: Town Manager: Morris Deputy, mdeputy@middletownde.org. 19 W. Green Street Middletown, DE 19709. www.middletownde.org.

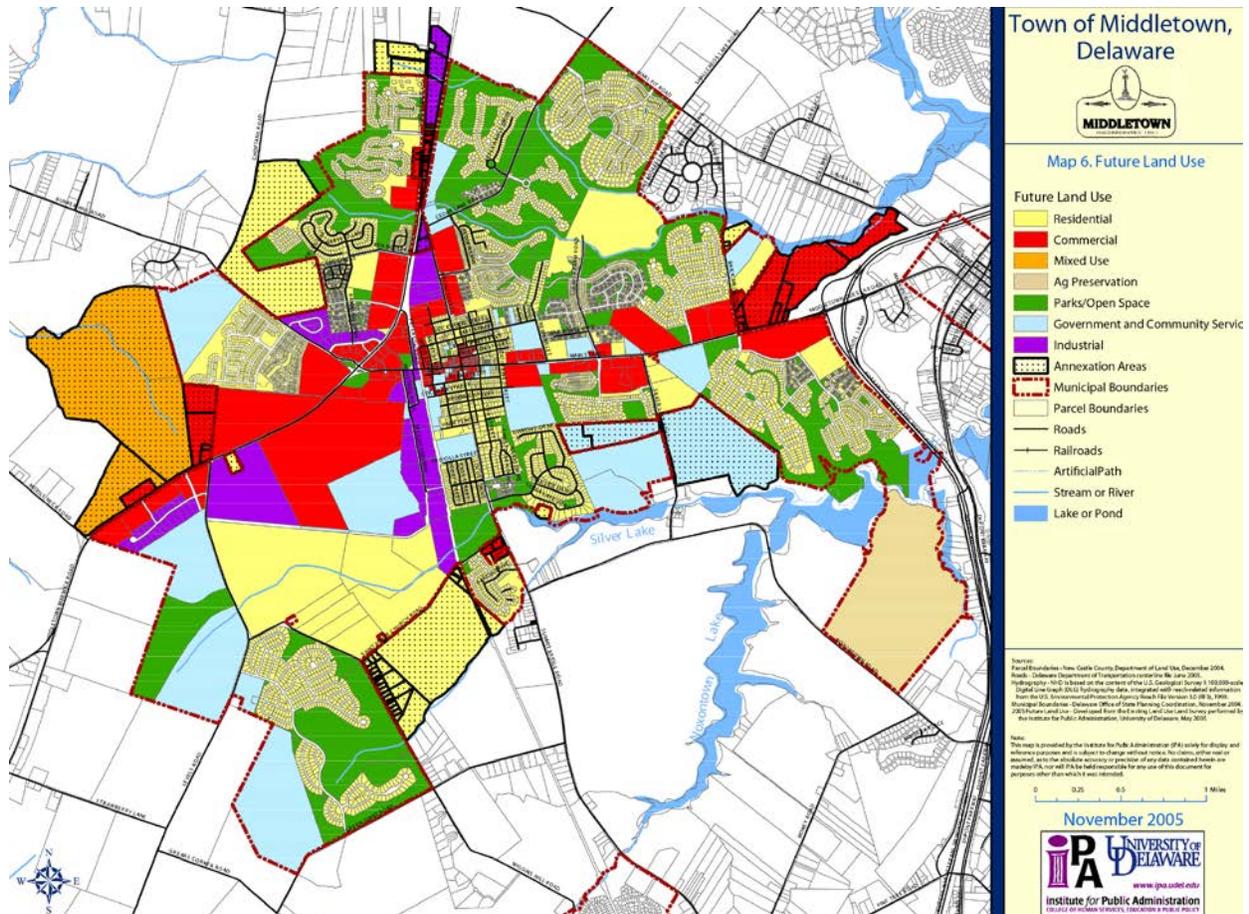


Figure 32: Future land use for the Town of Middletown

8.2.13 Seaford²³

Background

Seaford is a diverse rural Sussex County community located along the banks of the Nanticoke River that supports agriculture, industrial and medical industries. It has a population of approximately 7,000 residents.

The developed area of Seaford is served by fifteen sewage pumping stations and a gravity collection system that flows to the Seaford Wastewater Treatment Facility on the Nanticoke River. The treatment plant has a capacity of two million gallons per day and treats flows from Blades as well as Seaford. Average daily flows are reported to be approximately one million gallons leaving room for future expansion of the collection system. The facility underwent an \$8.3M upgrade in 1998 and now provides Biological Nutrient Removal of nitrogen and phosphorus. Sludge is composted with wood chips to produce a viable class A product that is sold to the public as a soil amendment. All combined sewers formerly located within the City of Seaford have now been separated and overflows plugged or eliminated. As the City grows outward from its perimeter, some older sewer lines may reach their capacity. As new areas are annexed and service provided, the collection system is monitored by the City and analyzed with the assistance of its engineer George, Miles and Buhr. In addition the City, by ordinance, evaluates the cost impact of the increased flows and has a methodology for cost recovery on a per EDU basis due to development. The excess capacity of 1 MGD is sufficient to serve an additional 2,700 dwelling units while leaving a reserve of 200,000 per day for industrial and commercial use. Preliminary engineering studies have confirmed that there is adequate space at the existing site for plant upgrade to ENR (Enhanced Nutrient Removal), and an expansion of an additional 1.0 MGD, or at least up to 3.0 MGD. Preliminary engineering analysis of the nutrient limitations promulgated by the WIP will have the effect on limiting the discharge to approximately 1.33 MGD and the excess capacity as 0.33mgd. Due to this limitation the City of Seaford is actively engaged in evaluating the recently acquired Municipal golf course for the application of treated effluent from the treatment plant. It appears that the load allocations will require the City to undertake a facility expansion to implement technology that will provide an ENR level of treatment and/or utilize alternative discharge options such as spray irrigation to accommodate growth into the future.

In addition the City treatment plant is a regional receiver of hauled septic waste. The facility accepts approximately 2.5 million gallons annually. This is a major environmental benefit to the region. Not only does it provide advanced treatment for this waste. Due to its proximity local haulers are afforded the opportunity to dispose of the water locally eliminating lengthy trips to other locations for disposal.

In addition to the City's wastewater treatment plant, several businesses have private treatment facilities that are not owned or operated by the City of Seaford. DuPont Corporation has a treatment facility of 679,000 gpd with a discharge to the Nanticoke River. Two other businesses have large septic systems, the Burger King Restaurant on Route 13 and Victoria Avenue, and Seaford Shell Station located near Routes 13 and 535. Additionally, Mobile Gardens Mobile Home Park is nearing completion of the installation of a nitrogen removal treatment facility. Several areas around Seaford's border have reported failing septic systems. These areas include Heritage Village, Beaver Dam near Wal-Mart, Devonshire Woods, Atlanta Estates, three houses on Front Street Extended, Seaford Heights, North Seaford Heights, the Island area located near Riverside Drive and Victoria Avenue, and dwellings near the Holiday Inn at Route 13 and Norman Eskridge Highway. Some of these areas may receive sewer service in the future if they are annexed.

²³ Seaford Contact Information: City Manager: Delores Slatcher, dslatcher@seafordde.com; Assistant City Manager: Charles Anderson, 414 High Street Seaford, DE 19973, <http://www.seafordde.com>.

Milestone Commitments

The City of Seaford recognizes the impact of its residents on local and regional water resources; as such the City of Seaford is committed to improving water quality in the Nanticoke River and its tributaries and ultimately the Chesapeake Bay. Seaford will continue to extend wastewater treatment service to local residents within the town's long-term growth and annexation areas to remove failing onsite septic systems as funding and opportunities become available. Seaford will continue to operate its Municipal Wastewater Treatment Plant in accordance with NPDES permit limits and incorporate new technology as improvements are needed to accommodate future growth. The Town's current NPDES Permit is expected to be updated in May 2013.

The City will also continue to review and update as necessary relevant codes and ordinances as described in Seaford's Comprehensive Plan to allow for and encourage protection and improvement of local water resources and remove barriers for implementing acceptable practices. Tetra Tech has provided the City with a review of their local ordinances along with a set of recommendations for consideration as they review and update ordinances. Tetra Tech has also provided model ordinances for the City's consideration. The recommendations and model ordinances are available in Appendix K and L. Seaford's Comprehensive Plan will be updated in 2019. In the meantime, Seaford will consider working with the Department and the Office of State Planning Coordination through a partnership with the University of Delaware Sustainable Communities Initiative in a master planning process that will engage the City of Seaford, the Town of Blades and Sussex that focuses on water resource protection for use in future comprehensive planning exercises and updates over the next several years.

The Land Use Subcommittee is committed to providing grant writing assistance to the City to address green infrastructure improvements within its boundaries. The subcommittee intends to work with the City to seek grant funding through the National Fish and Wildlife Foundation and/or other sources to provide green infrastructure improvements which will address nutrients and sediments from an extensive area.

The Restoration Subcommittee has completed an analysis on the percent of tree canopy existing within a 100 foot riparian area in each of the municipalities within the Chesapeake. Table 42 in Section 10 provides a breakdown of the canopy acres in each municipality.

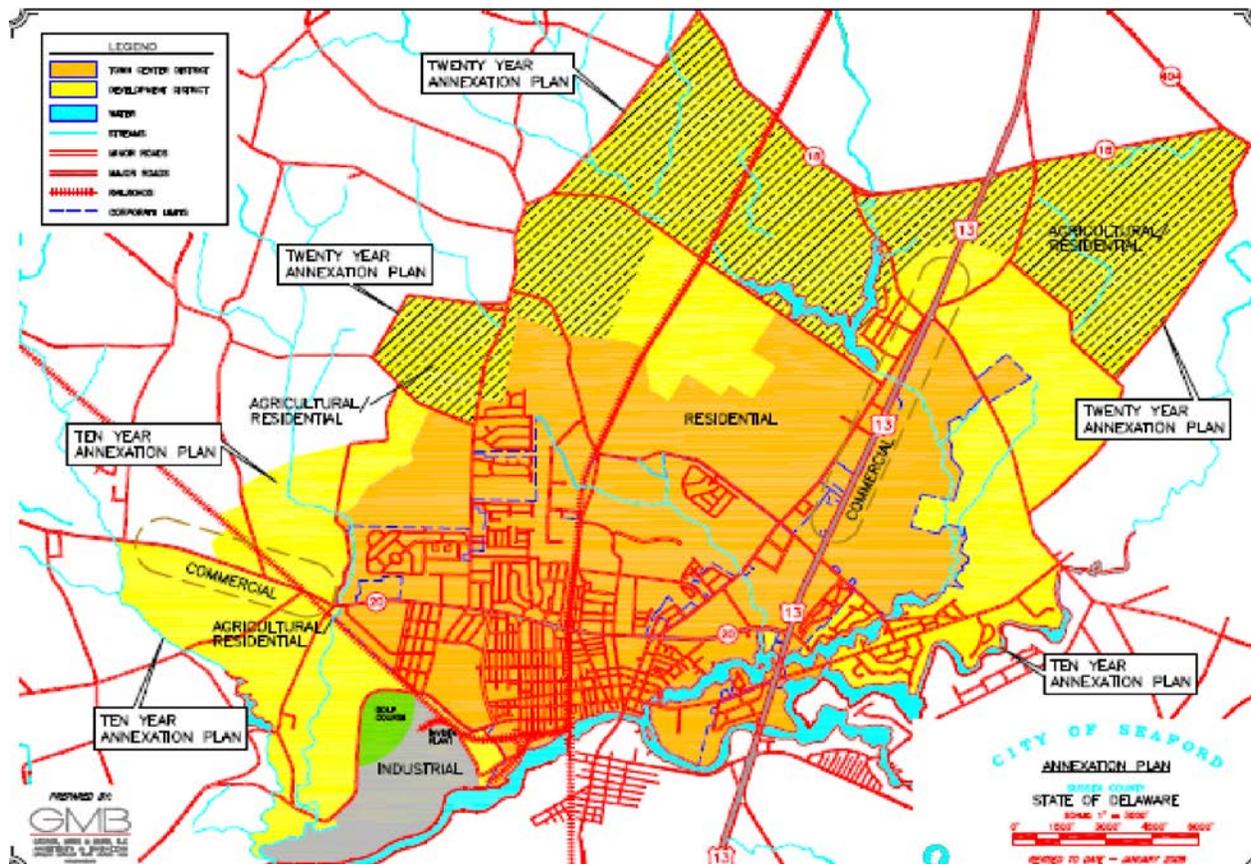


Figure 33: Future land use for the City of Seaford

8.3 Accounting for Growth

8.3.1 Projecting Future Growth

Growth is expected to occur across the State and within the Chesapeake drainage in Delaware (EPA data, Figure 34); however, when and where this growth occurs depends on local land use zoning and ordinances. EPA has provided the jurisdictions with their projections on growth parameters (see Table 31 for onsite system projections and Table 32 for developed land projections). To evaluate those projections and to better understand the projected growth within the Delaware segment of the Chesapeake Bay watershed, DNREC along with the Office of State Planning and Coordination (OSPC) and the University of Delaware collaborated to produce a build-out analysis of county and local jurisdictions through 2025. The University of Delaware developed the Community Land Use Model to consider the future growth which is determined by considering existing land uses, EPA Smart Growth Principals, proposed development projects, building permit absorption data and the State's Small Area Population projections.

Future growth is not expected to match the accelerated growth that occurred over the last decade. Epicenters of high density (>5,000 people/sq. mi.) lie within the municipal boundaries of Wilmington and Newark (Figure 35). This map was generated using ArcGIS to run a Kernel Density analysis on the 2000 Census Blocks.

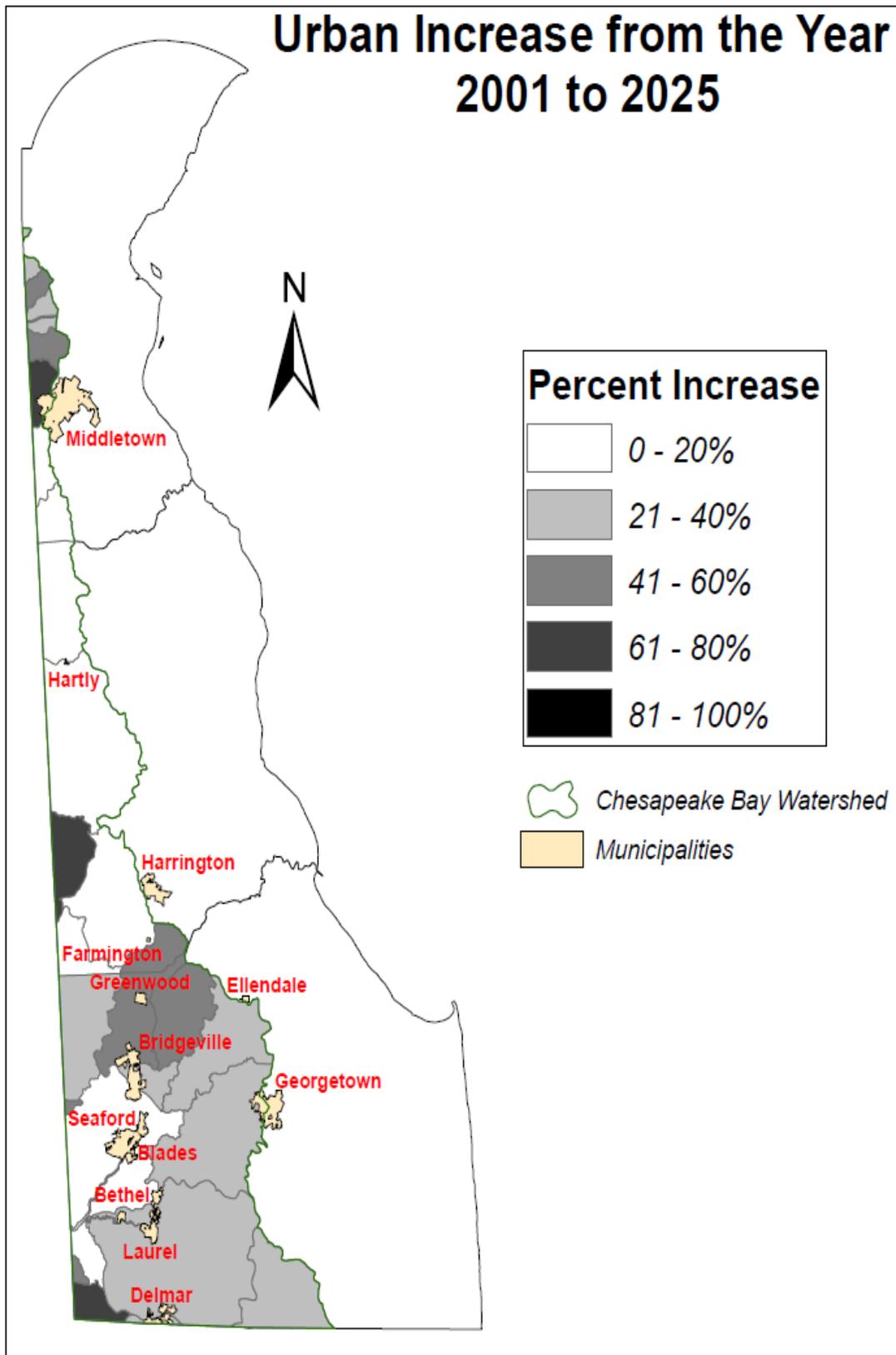


Figure 34: EPA's Estimated Increase in Developed Land in Delaware's Chesapeake through 2025

Table 31: EPA Projections on Septic System Increases (number of systems) between 2000 and 2025

Land River Segment	Septics 2000	Septics 2010	% Increase 2000 to 2010	Septics 2017	% Increase 2000 to 2017	Septics 2025	% Increase 2000 to 2025
A10003EU1_2981_0000	55	55	0	55	0	55	0
A10003EU1_2983_0000	281	416	48	512	82	613	118
A10003EU0_3010_0000	1,033	2,001	94	2,544	146	2,959	186
A10003EU0_3011_0000	317	599	89	729	130	806	154
A10003EU0_3201_0000	355	616	74	823	132	1,061	199
A10003EU0_3361_0000	187	212	13	230	23	252	35
A10003EU2_3520_0001	267	298	12	322	21	349	31
A10001EU2_3520_0001	634	820	29	887	40	941	48
A10001EM2_3980_0001	1,845	2,338	27	2,496	35	2,612	42
A10001EM3_4326_0000	265	342	29	371	40	395	49
A10001EL2_4400_4590	712	879	23	924	30	950	33
A10001EL2_4590_0001	134	166	24	175	31	181	35
A10005EL2_4590_0001	519	699	35	813	57	929	79
A10005EL0_4591_0000	24	34	44	41	75	50	111
A10005EL0_4594_0000	103	142	38	168	63	196	90
A10005EL0_4597_0000	36	50	42	61	72	73	105
A10005EL2_4634_0000	0	0	0	0	0	0	0
A10001EL0_4560_4562	237	288	22	300	26	304	28
A10005EL0_4560_4562	538	768	43	928	72	1,099	104
A10005EL0_4561_4562	576	835	45	1,018	77	1,223	112
A10005EL0_4562_0001	190	248	30	281	48	313	65
A10005EL0_4631_0000	537	715	33	825	54	934	74
A10005EL0_4632_0000	1,545	2,034	32	2,349	52	2,674	73
A10005EL0_4633_0000	3,003	3,972	32	4,582	53	5,196	73
A10005EL2_4630_0000	3,591	4,727	32	5,368	50	5,947	66
A10005EL2_5110_5270	332	438	32	504	52	570	72
A10005EL0_5400_0001	77	95	23	105	36	114	48
Total	17,392	23,788		27,411		30,796	

Table 32: EPA Projections on Developed Land Increases (acres) between 2001 and 2025

FIPSCAT	Total Developed Land 2001	Total Developed Land 2010	% Increase 2001 to 2010	Total Developed Land 2017	% Increase 2001 to 2017	Total Developed Land 2025	% Increase 2001 to 2025
A10003EU1_2981_0000	57	57	0	66	16	71	25
A10003EU1_2983_0000	248	251	1	293	18	330	33
A10003EU0_3010_0000	1,862	2,244	21	2,558	37	2,748	48
A10003EU0_3011_0000	713	823	16	912	28	956	34
A10003EU0_3201_0000	591	690	17	869	47	1,040	76
A10003EU0_3361_0000	34	34	0	37	9	41	19
A10003EU2_3520_0001	19	19	0	21	8	23	17
A10001EU2_3520_0001	311	314	1	339	9	359	16
A10001EM2_3980_0001	898	909	1	969	8	1,013	13
A10001EM3_4326_0000	45	64	42	69	54	73	63
A10001EL2_4400_4590	248	260	5	273	10	281	13
A10001EL2_4590_0001	85	85	0	90	5	93	9
A10005EL2_4590_0001	244	252	3	293	20	334	37
A10005ELO_4591_0000	1	1	0	2	23	2	48
A10005ELO_4594_0000	65	83	26	98	49	113	73
A10005ELO_4597_0000	0	0	0	0	20	0	43
A10001ELO_4560_4562	113	152	35	158	40	161	42
A10005ELO_4560_4562	1,312	1,325	1	1,597	22	1,867	42
A10005ELO_4561_4562	212	225	6	273	29	327	54
A10005ELO_4562_0001	200	222	11	251	25	278	39
A10005ELO_4631_0000	312	318	2	365	17	413	32
A10005ELO_4632_0000	1,327	1,372	3	1,603	21	1,834	38
A10005ELO_4633_0000	2,686	2,762	3	3,194	19	3,620	35
A10005EL2_4630_0000	4,436	4,436	0	4,826	9	5,262	19
A10005EL2_5110_5270	147	152	3	175	19	197	34
A10005ELO_5400_0001	307	309	1	346	13	376	22
A10005EL2_4634_0000	0	0	0	0	0	0	0
	16,475	17,359		19,676		21,811	

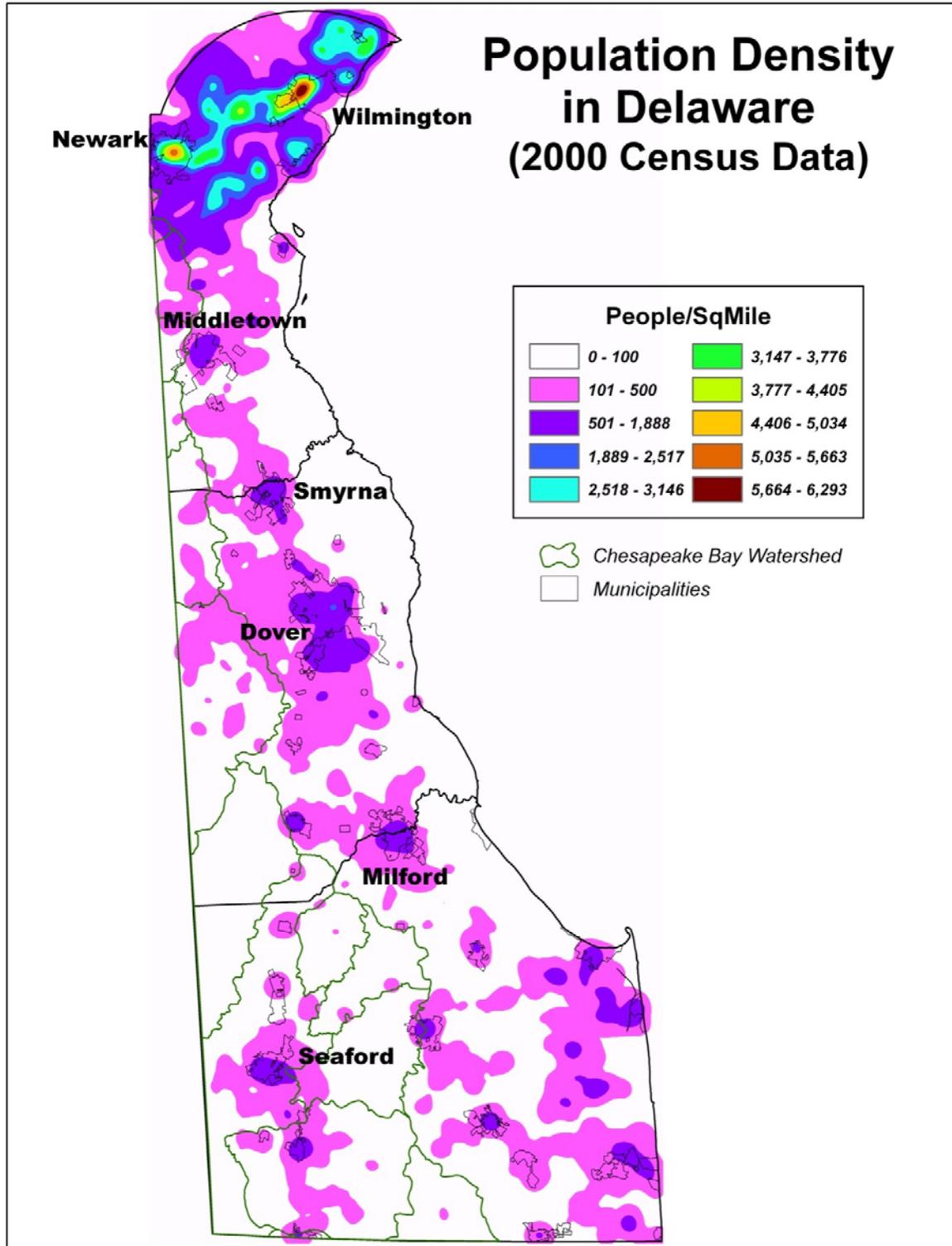


Figure 35: Population Density in Delaware from 2000 Census Data

Future Onsite Septic System Needs

More residential septic systems are anticipated to be installed within the watershed to support potential future growth; however, the timing and location of these installations will depend upon local land use decisions. EPA has provided the jurisdictions with their projections on these growth parameters, and that information is displayed in Table 31 and Figure 36. Delaware's Community Landuse Model will help the State and communities better understand the placement of these systems and how they might be mitigated through future central wastewater expansion, and to identify areas that are likely to experience growth through 2025, and to identify the potential growth to be on central sewer, individual septic systems and or on a community OWTDS. Based upon the inputs and assumptions in the Community Landuse Model, the State has determined the number of new septic systems within the watershed, the expansion of local and regional central treatment systems and the absorption of existing septic systems for the Delaware portion of the Chesapeake Bay watershed and classified these systems into the following:

Current Sewer – Areas within the watershed which are served by either the private wastewater provider or either a municipal or county wastewater treatment system.

Short Term Wastewater Expansion – These are areas within the watershed that are currently on septic systems; however, these will be absorbed onto a central wastewater system by 2017.

Long Term Wastewater Expansion – These are areas within the watershed that are currently on septic systems; however, these will be absorbed onto a central wastewater system by 2025.

Households on Septic in Chesapeake Bay Watershed in 2000

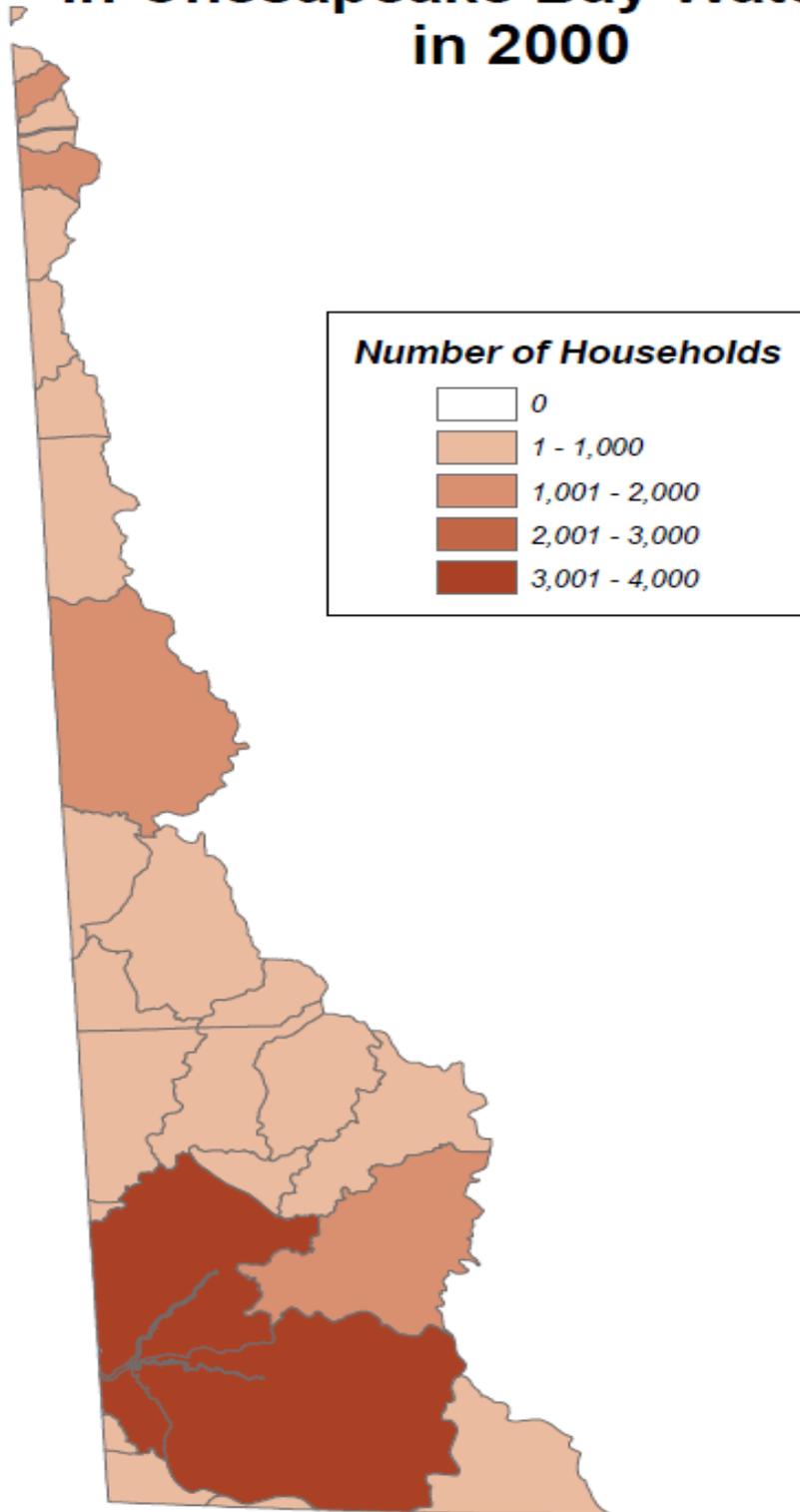


Figure 36: EPA's Estimated Number of Septic Systems in Delaware's Chesapeake in 2000

Community Land Use Model

The University of Delaware (UD) Sustainable Coastal Communities (SCC) Program in cooperation with DNREC and OSPC developed a land use model for the Delaware segment of the Chesapeake Bay Watershed. The model is built upon the *CommunityViz*[®] platform and will aid officials in visualizing land use issues and understand the consequences of land use policies while working to provide necessary information to implement environmental improvements in the Delaware portion of the Chesapeake Bay Watershed.

The SCC Land Use Modeling Team was tasked with the land use evaluation and modeling for the over 20 river segments (e.g. subwatershed) of the Chesapeake Bay Watershed within Delaware. The Bay watershed impacts all three Counties within Delaware, with the bulk of watershed located within Sussex County. Based upon Federal requirements, DNREC requested that the model should account for all activities within the watershed statewide. As a result of this requirement, statewide parameters were applied to the model's assumptions and constraints.

The general tasks of this project are described below and the full methodology and preliminary draft results can be found in Appendix E.

- Use the UD Community Land Use Model and *CommunityViz*[®] GIS platform to apply its 100-Acre grid to the entire Delaware portion of the Chesapeake watershed. The project will utilize the UD's previous work on defining Existing Land Use in Sussex County to expand the study area to the entire Chesapeake watershed within Delaware, showing current and projected land use and population changes through 2025.
- Incorporate small area population projections from the Delaware Population Consortium (DPC)
- Apply statutorily required comprehensive plans from Delaware's three counties and the 14 incorporated municipalities within the watershed for growth considerations.
- Assign the UD's model land use types to growth based on DPC projections for the 2005-2015²⁴ and 2015-2025 time frame.
- Perform *CommunityViz*[®] Build-out and Impervious Cover analysis for each of the Delaware Chesapeake Bay subwatersheds.
- Assign current and planned method of wastewater disposal by land use type to the 100A tiles in the subwatershed.

During Phase II implementation of the WIP, the Land Use Subcommittee and UD will work with the other Interagency Workgroup Subcommittees, counties, municipalities, wastewater utilities, and development groups to continue to fine tune the growth projections. This local information will be used to inform EPA's Land Use and Population Change Model and will be used to assist local jurisdictions develop future growth and infrastructure plans.

This entire analysis will also be used to inform future Delaware WIP goals and milestones. It will also help to focus communications strategies and planning efforts on segments and local jurisdictions where future growth will occur and those with the largest gaps and opportunities for improvement. Additionally, the model may be used as part of a Delaware Nutrient Offset program.

²⁴ DNREC requested growth projections to 2017 and 2025. DPC small area projections are estimated in five year increments. It was agreed by all parties that the UD would provide growth data for years 2015 and 2025, and that DNREC would extrapolate to year 2017 if necessary.

8.3.2 Targeting and Offsetting Nutrient and Sediment Loads from Future Growth

EPA has directed Chesapeake jurisdictions to either a) set aside currently unused pounds of Nitrogen and Phosphorous for future use or b) offset any new or increased loads as they occur in the future. In Delaware's Phase One Watershed Implementation Plan, the State opted to offset future loads. The development community in Delaware favors this and has officially endorsed an offset or trading program, believing it to be a more cost-effective means of complying with other requirements such as stormwater and wastewater.

EPA definition of offset: Compensating for the loading of a pollutant of concern from a point or nonpoint source with a reduction in the loading from a different source or sources, in a manner consistent with meeting water quality standards.

Delaware recognizes that in order to accommodate new or increased loadings of nitrogen, phosphorous, or sediment in this watershed, a mechanism that allows for quantifiable and accountable offsets of that new or increased load is necessary.

The State intends to offset future nutrient loads from lands proposed for development through a combination of

- a) Revised statewide stormwater regulations that are focused on water quantity but also achieve Chesapeake TMDL goals under a variety of development scenarios;
- b) A stormwater in-lieu fee to be applied if site constraints prevent the achievement of water quantity/quality goals on a specific parcel; and
- c) Providing an option that enables the offsetting of residual nutrient loads (including from onsite wastewater disposal) on another site within the same basin.

Because there are only four point sources in Delaware's portion of the watershed, with three of those four sources operating at levels significantly below their NPDES permit limitations, the Department has determined there is no immediate need to generate the large volume of credits required to enable treatment-plant startups or expansions. For the short term (through 2017), Delaware does not intend to develop the type of larger-scale, market-oriented credit-exchange program that aggregates best-management practices for trading.

8.3.2.1 Offset Future Nutrient Loads

Statewide Stormwater Regulations

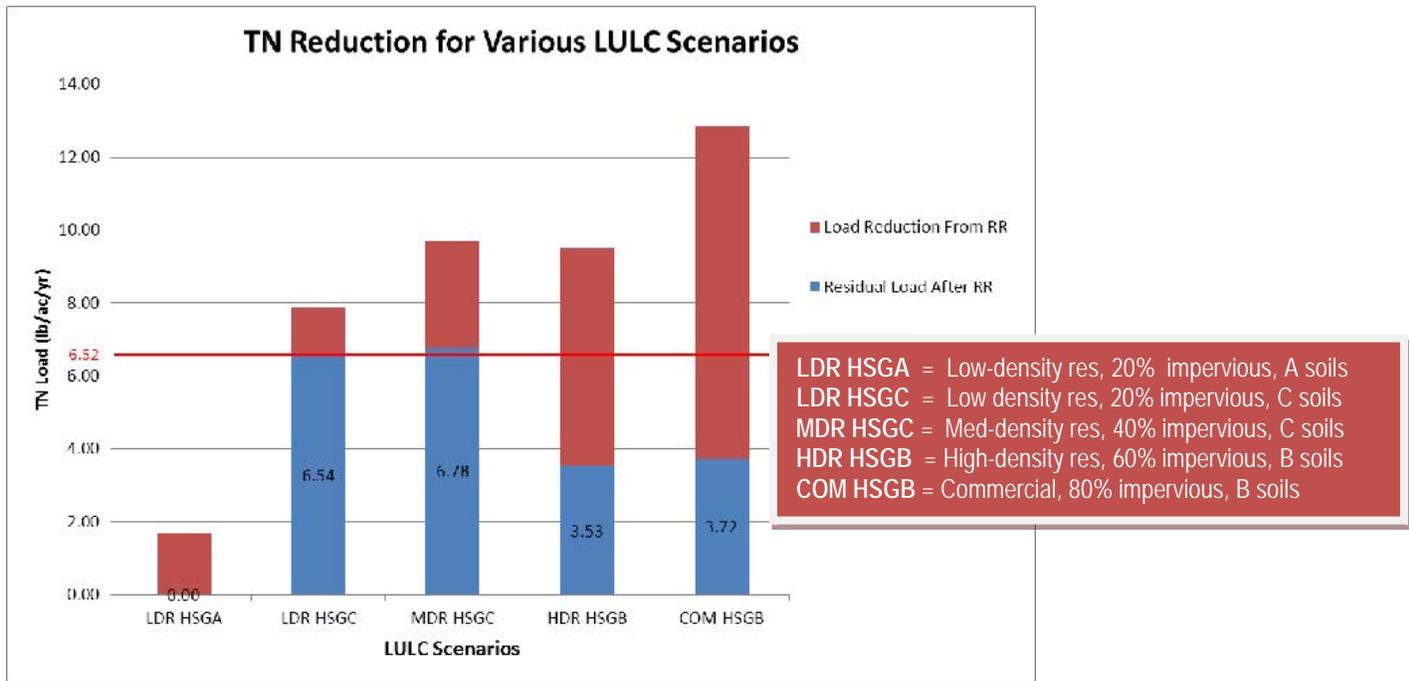
The Department's Sediment and Stormwater Program is on track to implement new statewide stormwater regulations in 2012, see Chapter 7. The new regulations contain the following language:

"Offset" means an alternate to strict adherence to the regulations including, but not limited to trading, banking, fee-in-lieu, or other similar program that serves as compensation when the requirements of these regulations cannot be reasonably met on an individual project basis.

Stormwater in-lieu fee

Working with the Center for Watershed Protection, Delaware's Sediment and Stormwater Program has developed a "common currency" for all shortfalls equivalent to the cost of treating unmanaged runoff volume. The cost of **\$23 per cubic foot of runoff volume** is based on land acquisition, construction and maintenance costs for unmanaged volume.

Figure 37: TN Reduction for Various LULS Scenarios



The Sediment and Stormwater Program ran five land-use/land-cover (LULC) scenarios – from low-density residential to high-density residential and commercial – through the Delaware Urban Runoff Management Model (DURMM). Results revealed that the Chesapeake Bay TMDL for Nitrogen is expected to be met in four of the five land-use scenarios (see chart above) by controlling for runoff volume under the new regulations.

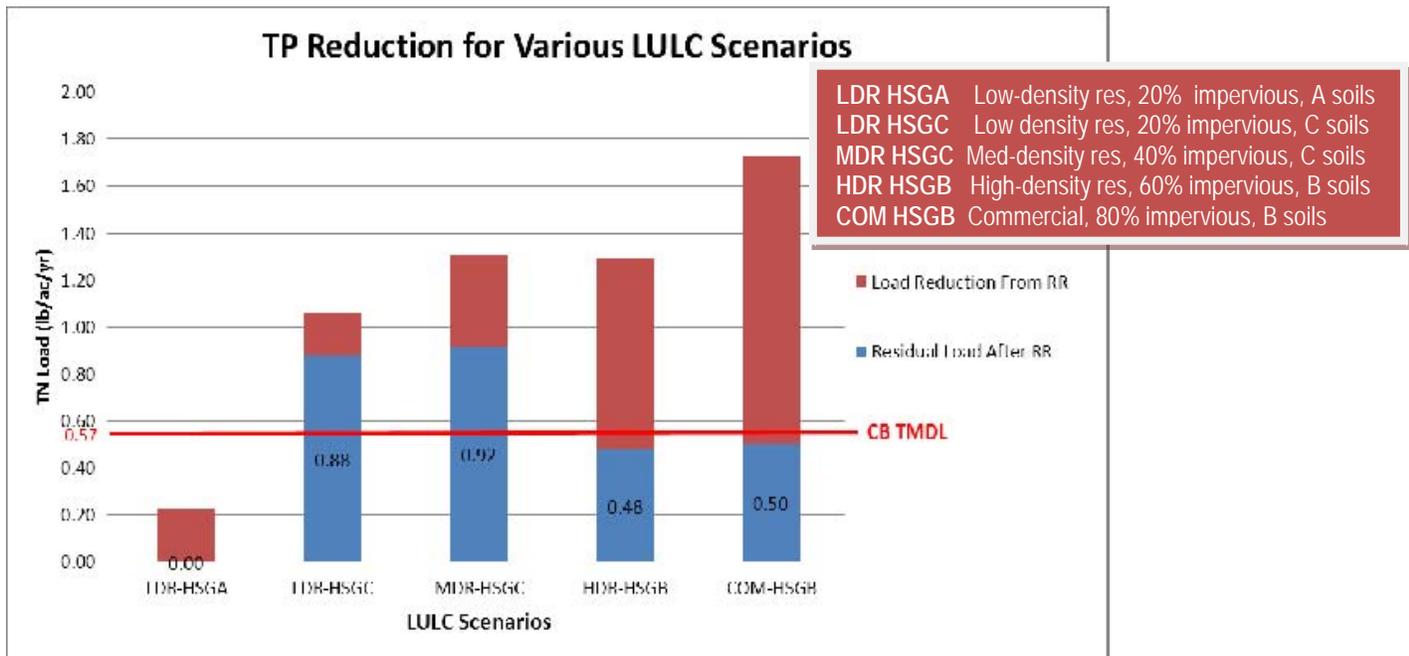


Figure 38: TP Reduction for Various LULS Scenarios

For Phosphorous (see chart above), the Chesapeake TMDL is expected to be met in three of the five Land-Use/Land-Cover scenarios by complying with the new stormwater regulations.

Therefore, compliance with the new stormwater regulations may translate, in most development scenarios, to TMDL compliance. In other scenarios there may still be residual nutrients to account for. There may also be nutrient loadings from onsite wastewater disposal systems that need to be accounted for and offset.

Requiring additional stormwater best management practices to offset these nutrient loadings could be very expensive. The stormwater volume “currency” is not an appropriate measure to use for accounting for nutrient contributions from individual septic systems and larger onsite wastewater treatment systems.

Factoring in onsite wastewater disposal

The Department's Ground Water Discharges Section is developing revisions to its statewide onsite wastewater disposal regulations (Chapter 6). The proposed changes would require new or replacement systems within 1,000 feet of tidal waters and associated tidal wetlands to comply with a 20mg/l limit for Total Nitrogen. There are no additional performance requirements for individual septic systems proposed in the regulations. Under the proposed regulations, all larger onsite wastewater treatment systems would be required to meet a performance standard based on the system size, age, and location.

In some scenarios, development could generate significant additional loading from onsite wastewater treatment. In accordance with the Chesapeake Bay TMDL, these new onsite wastewater loads will have to be offset. Delaware will use Appendix S of the Chesapeake Bay TMDL as a guide when determining how to offset septic loads from new growth.

8.3.2.2 Phased Approach

Because of the pressing need for the Stormwater Program to have an offset program available when the regulations are in place, the Department is pursuing a phased approach for implementation of an offset-trading program.

Phase One: Establish in-lieu fee for stormwater impacts (2012).

Under current state law²⁵ the Department has the authority to establish an in-lieu fee for erosion and sediment control. The Sediment and Stormwater Program, by the end of 2012, will determine which entities may collect the fees, how the fees would be collected and spent, and how projects would be prioritized and implemented. Programs may be operated and money spent at the local government or conservation district level under guidelines established by DNREC. The Department will also determine specific uses for the in-lieu fee.

Phase Two: Establish a statewide program that provides additional flexibility for offsets (2013).

- 1) Develop a GIS overlay that will identify priorities and opportunities for offsets statewide – e.g., nutrient “hotspots” and effectiveness areas, the Chesapeake Basin, 303(d) watershed segments, state-owned leased agricultural lands and conserved lands, identified restoration priorities, state strategy areas, etc.

²⁵ [7 Del.C. c. 40](#)

- 2) Under authority given by Delaware Code²⁶, the Department intends to develop and conduct an umbrella offset program and maintain a nutrient credit “bank.” A Start Action Notice to begin developing a nutrient offset regulation was signed by the Department’s Secretary in December 2011. The Department will work with a Regulatory Advisory Committee of stakeholders to develop rules regarding acceptable projects and locations, offset ratios, credit accounting, easements, monitoring, and assurances that the program satisfies Chesapeake Bay TMDL’s Appendix S, the ten “Common Elements” for generating offset credits²⁷.
- 3) The **Nutrient Budget Protocol** may be used as a tool to determine the post-development load that would have to be offset. Residual nutrient loads from the DURMM would be incorporated into the protocol as urban load in pounds per acre per day (or year).
- 4) In order to account for and be credited for load reductions, a **credit registry** would be established to identify and track available credits. A credit registry is a secure, official database that tracks information about environmental benefits generated by conservation actions that may be bought, sold or traded as credits in a market system. The Department would set the rules for offset transactions, but a credit registry could be operated by a third party and transactions could be bilateral between private parties – although transparency will be required to ensure that BMPs are being implemented and maintained and loads are being offset.

How a credit registry works

 - Sellers and buyers create accounts
 - Sellers register projects
 - Verification is documented
 - Certified credits are issued (w/serial #)
 - Credits transferred to buyer or retired
 - Reports to account holders and regulators
- 5) As with the stormwater in-lieu fee, the Department may delegate administration of an offset program to local governments that have the capacity for and would prefer to identify and implement their own offset projects (e.g., a stormwater utility, retrofits, riparian buffers, tree plantings, etc.)
- 6) The Department will track and determine how to address new or increased loads from all sources that occur prior to implementation of the offset program in 2013.

Phase Three: Determine whether to engage in broader, market-based trading program that includes point sources, agricultural BMPs and multi-state trading (2017).

With only four point sources in the Chesapeake watershed, and only one (Bridgeville) nearing its permitted capacity, Delaware does not anticipate a need for the large volume of credits other Chesapeake states need to amass before wastewater treatment plants can be built or expanded.

The Department ultimately may determine that sufficient credits can be generated with just a Phase Two approach.

8.4 Gap Analysis

Additional education and outreach with local governments and affected stakeholder groups is needed, particularly related to development of offset programs, accounting for future growth, planning and restoration opportunities. Additional focused guidance for local governments responsible for achieving and maintaining nutrient and sediment reductions into the future is needed.

²⁶ [7 Del. C. c. 6010](#)

²⁷ http://www.epa.gov/reg3wapd/pdf/pdf_chesbay/FinalBayTMDL/AppendixSOOffsets_final.pdf

The State currently does not have a formal trading or offset policy. In order to effectively track offsets, and provide a high level of assurance and accountability, a comprehensive offset program and regulation will need to be developed. The current tool available, the Nutrient Budget Protocol, requires significant modifications in order to produce results that are consistent with Chesapeake Bay Program modeling assumptions.

The Department is encouraging local municipal wastewater treatment plants to eliminate septic systems through system expansions. However this beneficial practice creates a potentially negative impact to local growth capacity in the future.

8.5 Strategy to Fill Gaps

The following are strategies that can and will be used to address the impacts of land use and comprehensive plans on nutrient and sediment loading in the Chesapeake.

8.5.1 Nutrient offset program with use of the Nutrient Budget Protocol as a tracking tool

The Department views the development of an offset program as a key element in achieving both water quality and quantity goals in this watershed and throughout Delaware. As noted above, our path forward will involve different stages. First, the offset program for stormwater proposed in the stormwater regulations will continue to be developed and go into effect (2012). Second, we will develop a separate set of regulations for offsets which will conform with EPA guidance and Appendix S of the TMDL. Promulgating this regulation is not likely to occur until the end of 2012 at the earliest. Additionally, DNREC will work with the Office of State Planning Coordination to determine the role of the State's PLUS process in tracking new or increased loads, and how this process can communicate requirements for net improvement offsets.

- **Nutrient Budget Protocol Tool.** Tetra Tech has modified an internally developed tool for determining the impacts of different land uses and best-management practices on nutrient loads when a parcel changes land use. The goal is to make this a more user-friendly tool that the state, local governments and developers can use to assess and track nutrient and sediment loading impacts of development projects. This tool be rolled out to local governments in 2012. The Scope of Work: Modifying Delaware's Nutrient Budget Protocol for Use as an Offset Tracking Tool in the Chesapeake Bay Watershed is Appendix F.
- **Credit banking/trading program.** DNREC is researching the experiences of other states developing and operating trading programs in the Chesapeake watershed to provide information and best practices as we work to develop a statewide offset program. The Department is also meeting with credit aggregators, mitigation bankers and proponents of trading.
- **Assess the potential of publicly owned lands.** Approximately 40,000 acres of publicly owned land exists in the Chesapeake watershed, the majority of it managed by DNREC and the Delaware Department of Agriculture (See Section 11). As outlined in Section 10, Ecological Restoration, the department has identified significant restoration opportunities in the watershed, particularly the Nanticoke. The DNREC and DDA are committed to implementation of BMPs on those lands under their management.
- **Assess the potential of alternative technologies to meet nutrient goals.** DNREC would like to develop partnerships with companies that are beginning to successfully commercialize new technologies to help local governments as well as industry achieve nutrient goals and permit requirements through alternative technologies.

8.5.2 Technical Assistance

The Department will provide technical assistance to local governments through training, outreach and tools, including recommendations on ordinance improvements, technical review and assistance for implementation of best management practices at the local level, and identification of potential financial resources for implementation. Tetra Tech has provided the Local Governments with a review of local ordinances along with a set of recommendations for consideration as they review and update ordinances. Tetra Tech has also provided model ordinances for consideration. The recommendations and model ordinances are available in Appendix K and L.

8.5.3 Strategies for State Policies and Spending

An overall land-use policy, the Strategies for State Policies and Spending, directs growth to areas already prepared for it in terms of infrastructure, services, and intergovernmental planning. This document, the state's blueprint for growth, has been in existence since 1999 and was updated in 2011. Much of the Chesapeake watershed in Delaware, except for the relatively small municipalities, is in non-growth areas where the state would like to limit investment in agriculture and land preservation. The state limits its investment to agribusiness and land preservation in non-growth areas. In other words, it does not invest in schools or roads in these areas. For example, as a matter of policy, the state Department of Transportation does not provide funding for local development outside of designated growth areas.

8.5.4 Align growth strategy, investment and TMDL action

These should not work at cross purposes, but coordinate to encourage growth in higher-density municipalities, on sewer, rather than large-lot, low-density development on septic. Priorities for investment should include wastewater treatment plant upgrades that enable residential and commercial growth in Seaford, Laurel and Bridgeville. In its draft Watershed Implementation Plan, Maryland cites the imbalance created by nutrient caps on WWTPs without similar constraints on loads from septic systems. Per household, the nutrient load from new development on well and septic is almost 5 times the amount of new loads from sewered areas, Maryland calculated. Delaware faces the same imbalance and the same need for more non-agricultural BMPs to be established.

8.5.5 More proactive comprehensive planning

For the counties and municipalities within the Chesapeake watershed, DNREC will play a more proactive role in communicating TMDL requirements before the comprehensive plan is due, in addition to working with the jurisdiction on a compliance strategy. DNREC will meet with jurisdictions a year before their comprehensive plan update is due in order to explain the TMDL requirements and process, the allocation for that particular subwatershed, a toolbox of methods for meeting the pollution reduction goals, and the consequence of not taking definitive steps toward achieving those goals. DNREC will also provide model TMDL language for local governments to include in their comprehensive plans. If comprehensive plan requirements are not met or the local government has not complied with related laws and violations, the State can withhold certification of a comprehensive plan and – as a last resort – withhold discretionary funding, according to State law.

8.5.6 Target actions in the most “effective areas

The towns in the Nanticoke watershed in Sussex County are in an area with a highly “effective” level of contribution to Bay pollution, according to an October 2009 GIS analysis of nitrogen and phosphorous by EPA (Figure 39) . Targeting this area would have a larger impact on the Bay’s water quality than focusing on other areas with both tighter land-use controls and lower potential for pollution impact.

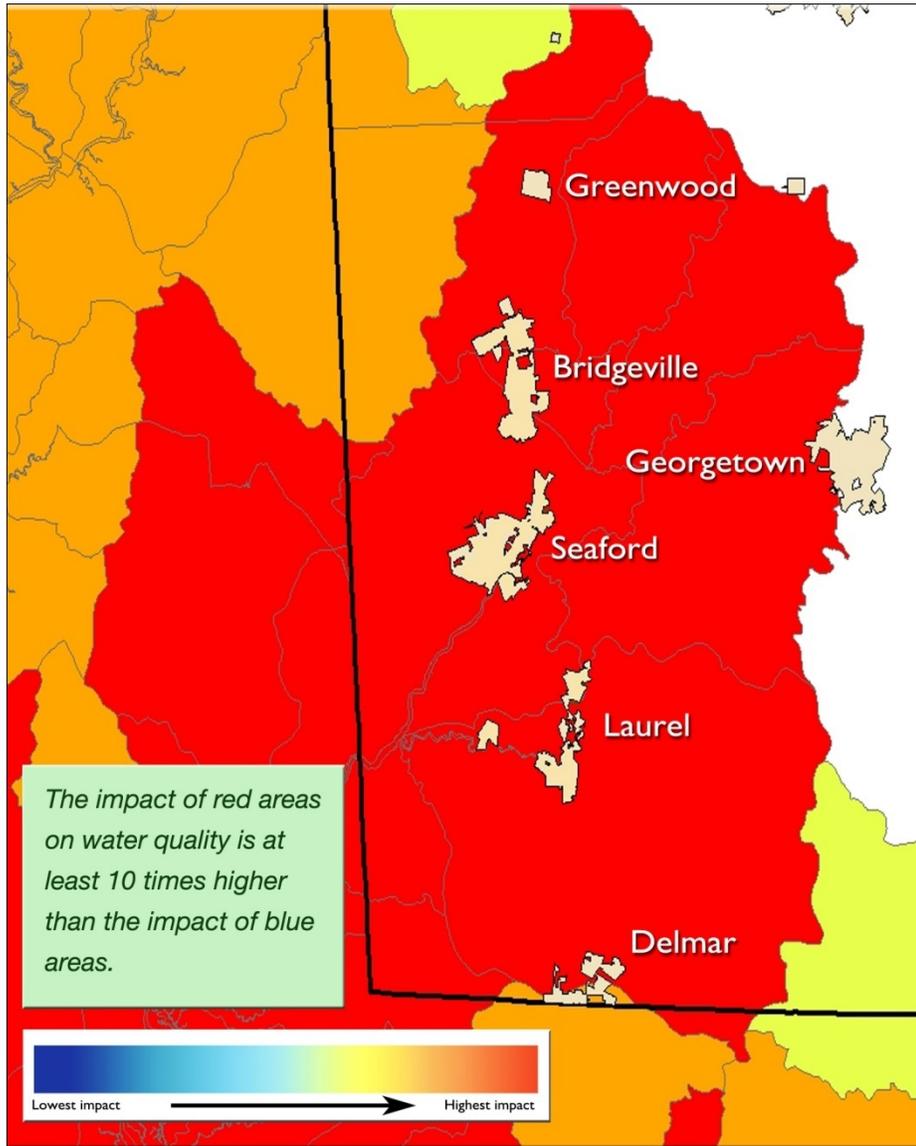


Figure 39: "Effective Areas of the Chesapeake"

8.5.7 Master plan for Bridgeville –Seaford-Laurel Corridor

The Land Use Subcommittee through a partnership with the University of Delaware Sustainable Communities Initiative will engage communities and counties in a master planning process that focuses on

water resource protection for use in future comprehensive planning exercises and updates over the next several years. Bethel and Greenwood, with funding through a NFWF grant will be the first area to develop their Master Plan, in 2012. Laurel and Bethel will follow in 2013, and Seaford and Blades will be completed in 2014. Smaller communities of Delmar, Ellendale, Hartly, Farmington etc will be completed by 2014. In all cases the counties will be engaged in this process as well as other critical stakeholders. Funding from the CBRAP grant has expedited this process.

8.5.8 Conservation Opportunity Areas

A science- and watershed-based strategy for prioritizing the department's work, called Conservation Opportunity Areas (COAs) will be developed in 2012. COAs are a means of identifying areas where different departmental and environmental priorities such as habitat, water quality, wetlands protection, and forest preservation overlap to focus limited resources, and build partnerships with local governments, federal agencies, individual landowners and nonprofit organizations.

8.5.9 Transfer of Development Rights and Purchase of Development Rights

Transfer of Development Rights and Purchase of Development Rights as elements of comprehensive plans to direct higher-density development into existing towns but lower impervious cover throughout the watershed. Efforts to create statewide TDR legislation, with a bank, have been unsuccessful, but local governments are already empowered by statute to create their own programs. The State could also provide technical assistance. Kent County's TDR program has been used successfully, and its sending areas (where land would be preserved) include the Chesapeake watershed portion of the county. Also, the State could more closely align its very successful PDR program and its newer Forest Preservation Program with watershed priorities such as the Nanticoke.

8.5.10 Wetlands banking and fee in-lieu

DNREC has been approached by several consulting firms interested in creating wetland banks, including one already established that straddles the Nanticoke and Pocomoke watersheds. In addition, the US Army Corps of Engineers has indicated an interest in working with DNREC to set up an in-lieu fee program, which is the department's preferred method of handling wetlands mitigation. We recognize that the state needs a clearly stated and straightforward policy on wetlands mitigation, and that such a policy would be a tool for achieving TMDL goals.

8.5.11 Stormwater Utilities

Stormwater Utilities are already enabled by state law (Delaware Code Title 7, Chapter 40). Local governments are empowered to establish these utilities to manage stormwater runoff and address water quality and quantity challenges; however, Wilmington is the only municipality to adopt such an ordinance since the law took effect in 1990. A stormwater utility could be a relatively cost-effective means of achieving TMDL targets, especially in the Seaford-Laurel-Bridgeville portion of the Nanticoke watershed. Similarly, Kent County supports the establishment of a countywide stormwater facility maintenance program to increase monitoring of stormwater management and discharge in order to decrease the amount of pollutants reaching water bodies in the county. We can provide education and technical assistance, and perhaps demonstrate that proactive initiatives such as a utility are preferable to more draconian measures.

8.5.12 Urban/Suburban Fertilizer Use

Watershed based “Tributary Action Teams,” the agricultural community, and the home building community have advocated more outreach to homeowners, lawn-care companies, and retailers on urban and suburban fertilizer use and application. Delaware’s Nutrient Management Law²⁸ requires anyone applying nutrients to ten acres or more as a commercial venture or on personally owned lands to be certified; this includes commercial lawn care companies, golf courses, commercial nurseries, and farmers.

Delaware’s Phase I WIP listed, as a contingency, the possibility of developing a model fertilizer regulation/ordinance to roll out by a date certain (such as 2017) if quantifiable progress is not being made to reduce nutrient loads from suburban development. Such a regulation could consider elements such as:

- Fertilization only during certain times of the year
- Require a soil test before applying fertilizer
- No phosphorous unless need is indicated by soils test
- No application with 20 or 25 feet of a waterway
- More transparent and explicit labeling
- Fee per bag
- Required training/licensing fee for commercial residential applicators
- Limit on golf course applications
- Limit on number of applications
- No application when ground is saturated or before runoff-producing rainfall

However, during the development of Delaware’s Phase II WIP, non-farm fertilizer sales data has been analyzed and suggests that a new law or regulation prohibiting the sale of phosphorus fertilizer in the urban/suburban environment is not necessary. The Delaware Commercial Fertilizer and Soil Conditioner Law²⁹ requires fertilizer registrants to report to the Delaware Department of Agriculture (DDA) the amount of fertilizer they distribute in Delaware. The tables below represent the tons of nutrients distributed in Delaware and do not represent the amount of fertilizer land-applied in Delaware. These tables are based upon information reported to DDA for fiscal years (FY) 2005 – 2010.

Table 33: FY 2005-FY 2007 Non-Farm Nutrient Tonnage by County

County	FY2005 Nitrogen (N)	FY2005 Phosphate (P ₂ O ₅)	FY2005 Potash (K ₂ O)	FY2006 Nitrogen (N)	FY2006 Phosphate (P ₂ O ₅)	FY2006 Potash (K ₂ O)	FY2007 Nitrogen (N)	FY2007 Phosphate (P ₂ O ₅)	FY2007 Potash (K ₂ O)
Kent	1,605	416	784	1,041	185	197	660	112	158
New Castle	1,085	232	386	872	187	265	915	150	288
Sussex	903	157	528	339	74	92	1,666	270	830
Unknown	13	5	7	21	21	20	472	25	1,369
Totals	3,606	810	1,705	2,273	467	574	3,713	557	2,645

Table 34: FY 2008-FY 2010 Non-Farm Nutrient Tonnage by County

²⁸ 3 Del. C. c. 22

²⁹ [3 Del. C. c. 21](#)

County	FY2008 Nitrogen (N)	FY2008 Phosphate (P ₂ O ₅)	FY2008 Potash (K ₂ O)	FY2009 Nitrogen (N)	FY2009 Phosphate (P ₂ O ₅)	FY2009 Potash (K ₂ O)	FY2010 Nitrogen (N)	FY2010 Phosphate (P ₂ O ₅)	FY2010 Potash (K ₂ O)
Kent	916	96	206	494	48	109	212	12	56
New Castle	723	116	235	405	57	132	228	29	73
Sussex	323	63	139	278	21	82	150	19	57
Unknown	64	17	21	79	8	22	50	6	23
Totals	2,026	292	601	1,256	134	345	640	66	209

Laboratory analysis results show that the tons of P₂O₅ sold in Delaware for non-farm use have decreased from 810 tons per year in 2005 down to 66 tons per year in 2010, which is a 92% reduction. DNREC and DDA believe that the decline is due to the phosphorus ban in home use fertilizers implemented in neighboring states. Delaware is within the same marketing region as neighboring states and so benefits from the ban implemented in those states. A survey by staff as well as a survey conducted by the Livable Lawns Program in 2011, found that local suppliers of home-use fertilizers, such as Lowes, Home Depot and Southern States no longer carry products with high levels of phosphorus.

In light of these results and based on availability of fertilizers and existing law and program in place, Delaware now feels that regulating residential fertilizer use is an unnecessary contingency. In addition, we believe that Delaware should receive credit for an urban fertilizer P ban in our WIP and in Chesapeake Bay Model calculations. Delaware is participating with the Urban Fertilizer Management Panel and has successfully requested that the panel include in their charge considering “credit for jurisdictions without a P Ban, but all available lawn fertilizers comply with standards set by surrounding jurisdictions with P Bans.”

As an added margin of safety providing reasonable assurance that fertilizer will be appropriately managed in the urban and suburban environment, a voluntary program known as [Delaware Livable Lawns](#), administered through the Delaware Nursery and Landscape Association, has been developed to provide education, outreach, and certification for suburban fertilizer use and certification of lawn care companies. The Delaware Livable Lawns Program, a voluntary homeowner education and commercial lawn-care certification program, is being taken statewide in 2012. The Program includes the following elements:

- Keep fertilizer and grass clippings off any impervious surfaces. This involves sweeping granules and clippings back into the grass from sidewalks, driveways and other areas after application.
- Leave behind educational lawn care material and explain to the homeowner that he/she needs to follow the provided lawn care guidelines when performing any lawn care on their own, in order to maintain the integrity of the program.
- For new clients of commercial applicators, test the soil for phosphorus, potassium and pH to determine the specific needs of the lawn before application.
- For established clients of commercial applicators, test the soil once every two years for phosphorus, potassium and pH to determine the specific needs of the lawn.
- For all lawns, do not apply phosphorus or potassium if soil test levels are above optimum. If soil tests show a need for phosphorus, apply no more than 1 lb/1000 sq ft per application.
- Fertilizer application is prohibited between December 7 and February 15.
- Calibrate spreaders for correct application of fertilizer and record the pounds of nutrients applied to each lawn.

- All lawn care companies are required to submit the following once per year:
 - Name, address and contact information of lawn care company
 - Total number of customers and total number of new customers gained since certification.
 - Total area of lawns maintained
 - Total nitrogen applied to lawns, broken down by month of application. If applications vary from recommended timing, provide an explanation.
 - Keep all soil test results and application information for 3 years to be randomly audited.
- Meet ALL the nitrogen and phosphorus application in the following table.

Table 35: Requirements for Fertilizer Use for the voluntary homeowner education and commercial lawn-care certification program

Turfgrass Species	Max Amount of Nitrogen Over Entire Year	Suggested Application Rates and Timings When Using Fertilizer Containing Less than 35% SAN*	Suggested Application Rates and Timings When Using Fertilizer Containing More than 35% SAN
Cool Season Grasses (eg. Tall Fescue, Perennial Rye, Fine Fescue, Kentucky Bluegrass)	3 lbs/1000 ft ²	March/April: 0.5 lbs/1000 ft ² Sept: 1 lb/1000 ft ² Oct: 1 lb/1000 ft ² Nov: 0.5 lb/1000 ft ²	Aug: 1.5 lbs/1000 ft ² Oct: 1.5 lbs/1000 ft ²
Warm Season Grasses (eg. Bermudagrass, Zoysiagrass)	3 lbs/1000 ft ²	May: 1 lb/1000 ft ² June: 1 lb/1000 ft ² July/Aug: 1 lb/1000 ft ²	May: 1.5 lb/1000 ft ² July: 1.5 lbs/1000 ft ²

*SAN – Slowly Available Nitrogen

In addition to the requirements outlined above, lawn care companies certified with this program should adhere to the following recommendations:

- Provide a copy of resident's soil test to them so they understand how your lawn care company is fertilizing their lawn based on test results
- New seeding with turf-type tall fescue is recommended
- Use slow release fertilizers

8.5.13 Educational outreach and increased conservation activities by individual homeowners

DNREC and the Delaware Nature Society have partnered with the National Wildlife Federation to implement the Backyard Habitat Program statewide. Homeowners are encouraged to landscape with native plants to provide additional habitats for wildlife, and are further required to implement at least 5 sustainable gardening activities designed to reduce or purify stormwater runoff. Options for sustainable gardening include rain barrel, maintaining a rain garden, eliminating chemical fertilizers, eliminating chemical pesticides, allowing vegetated buggers around natural water features, reducing erosion, or using a certified "Livable Lawn" landscaper. Once a homeowner achieves a wildlife and water-friendly landscape, they are recognized through a certification process that is intended to inspire neighbors to do the same. All land that is certified and implements the sustainable gardening practices could be tracker and the acreage could be reported to DNREC on a quarterly basis. This would allow Delaware to provide EPA with concrete data showing nutrient reduction.

8.5.14 Effective communication

Develop strategies for effective communication with local governments and stakeholders (e.g., Home Builders, Sussex County Association of Towns, Farm Bureau, Realtors, environmental advocates, etc.) to:

- Communicate the percentage of nitrogen, phosphorous, and sediment reductions already achieved and the reductions still needed in the future from the various source sectors by land-river segment

- Clearly communicate the benefits of achieving water quality goals for economic development, tourism, recreation, and quality of life

- Clearly communicate the cost of failure

- Develop effective means of communication with average citizens (video, interactive workshops, Web 2.0 applications, community events, schools, feature-rich website) to gain support for meeting water-quality goals

8.6 Best Management Practices

8.6.1 Urban Nutrient Management (Residential Fertilizer Use)

During the Phase I process, we set a goal of having 95% of urban lands covered by an urban nutrient management plan by 2025. Delaware has observed a 92% reduction in the amount of phosphorus in fertilizer sold for non-farm use since 2005 (see discussion above regarding residential fertilizer use). This is likely a result of the phosphorus fertilizer bans in neighboring states. We would like to receive the same credit in the model as those states with the ban. We would like to work with EPA staff to determine how best to incorporate our data into the model to receive the appropriate credits – whether that be as the urban nutrient management BMP or another method of reducing inputs to the urban environment; until then, we will leave the original goal and assume we are close to achieving it already.

GOAL: 95% of urban lands with urban nutrient management

8.6.2 Urban Tree Planting (Urban Tree Canopy)

The Delaware Forest Service and the Delaware Office of State Planning and Coordination recognize the importance of tree canopy in communities. Trees help to clean our air and water while enhancing the quality of life for Delaware's residents. The State is working in cooperation with federal partners to implement TMDL requirements through the enhancement of forest resources within cities and towns throughout the Bay watershed. The Delaware Forest Service and DOSPC are doing GIS analyses to determine the current level of urban tree canopy in each municipality across the State. These values are then being compared to canopy cover goals for suburban residential, urban areas, and central business districts (this information will be used to set urban tree planting goals for Phase II of this WIP). Where current levels fall short of goals, the agencies will work the community to incorporate in the comprehensive plans specific recommendations. Recommendations may include acquiring conservation easements to protect existing canopy, developing landscape requirements for new developments, or tree planting along rights-of-way. Currently, there are only 99 acres recorded.

GOAL: Maintain existing 99 acres of urban tree planting; Future TBD

8.6.3 Urban Growth Reduction

Delaware does not currently have any data on this practice. The Land Use and Comprehensive Plan Subcommittee will investigate potential goals.

GOAL: TBD.

8.6.4 Impervious Urban Surface Reduction

Delaware does not currently have any data on this practice. The Land Use and Comprehensive Plan Subcommittee will investigate potential goals.

GOAL: TBD.

8.6.5 Forest Conservation

Delaware does not currently have any data on this practice. The Land Use and Comprehensive Plan Subcommittee will investigate potential goals.

GOAL: TBD.

8.7 Contingencies

If the above strategies and strategies from other sectors are unsuccessful, the Land Use and Comprehensive Plan Subcommittee has identified the following action as a contingency.

- **Additional MS4 permit** in Seaford-Laurel-Bridgeville corridor after 2020 Census progress toward achieving TMDL targets is unsuccessful.

8.8 Tracking and Reporting Protocols

Tracking and reporting loads related to changes in land use can be accomplished using two tools – the Nutrient Budget Protocol and DURMM. DURMM will be used to calculate the volume of stormwater runoff from a proposed development project and the associated nutrient and sediment loads. Information from DURMM will be plugged into the Protocol, which calculates the total loads from a parcel pre and post development. DNREC staff and Tetra Tech contractors have been working with EPA to ensure that loads calculated by these models on a project or parcel scale are compatible with the loads calculated by the Chesapeake Bay Program watershed model. These tools will be incorporated into offset programs and available for local use.

As BMPs are installed on new projects, the practices will be recorded in one of the existing databases. Work is underway to extract information regarding onsite system and stormwater BMPs into the National Environmental Information Exchange Network (NEIEN) schema so that data may be directly sent to the Chesapeake Bay Program through network nodes and receive credit in the model. A description of data generation and acquisition, assessment and oversight, and data validation and usability will be provided in Delaware's Nonpoint Source Best Management Practice Implementation Data Quality Assurance Project Plan (Appendix C). The QAPP was updated and approved by EPA in the spring of 2011. DNREC staff is also participating in the development of the Bay TMDL Accounting and Tracking System (BayTAS) Version 1.0 to track the TMDL waste load allocations and load allocations and Delaware's progress toward meeting those goals.

8.9 Sea Level Rise Considerations

Several communities along the Nanticoke River in Delaware may be impacted by rising sea level including Bethel, Blades, Laurel, and Seaford (Figure 40). These communities can and should take a proactive approach to sea level rise and consider the impacts of potential inundation during their comprehensive planning processes. They may wish to consider conducting a site-specific vulnerability assessment for storm flooding and sea level rise to better understand the potential impact of inundation to the shoreline, infrastructure, and buildings and the impact those affects may have on local water quality. They may then develop recommendations for how to deal with those potential impacts.

These communities may want to consider preserving undeveloped areas within the 0.5, 1.0, or 1.5 meter scenarios to allow for wetland retreat as waters rise. To allow for natural migration, the communities may advocate the use of “living shorelines” rather than bulkheads. For areas already developed within the potential inundation areas, they may want to consider if the existing structures can accommodate wetter conditions with additional protections or if they should retreat inland over time. They may also consider prohibiting new septic systems within the areas at risk.

In addition to inundation of land and structures, communities also must consider public and domestic water supplies since in southern Delaware, groundwater is the source of drinking water and these supplies may be contaminated by salt as sea level rises. Saltwater intrusion into drinking water supplies is not yet well understood.

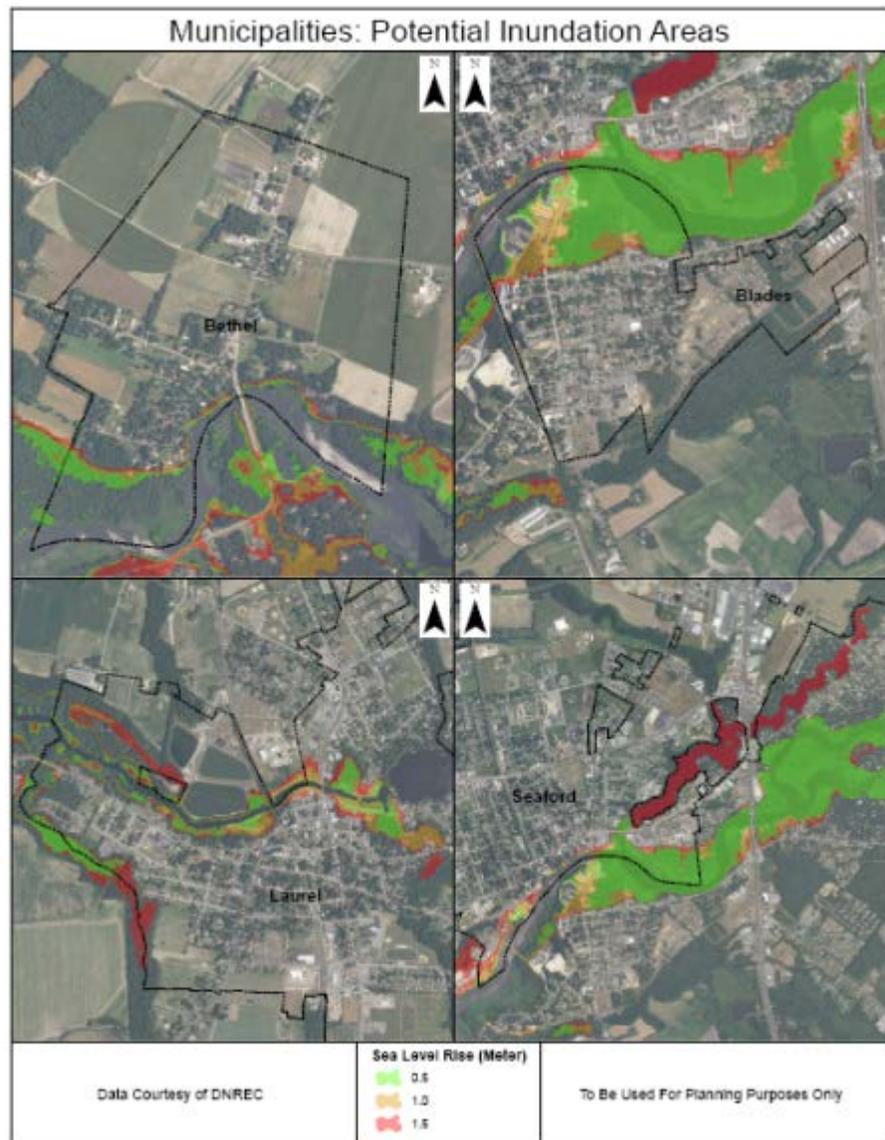


Figure 40: Potential Inundation Areas in Municipalities

SECTION 9. AGRICULTURE

This section of the Chesapeake Bay Watershed Implementation Plan – Phase II has been developed by the Agriculture Subcommittee of Delaware's Chesapeake Interagency Workgroup. The Agriculture Subcommittee represents a diverse array of programmatic expertise from active farming operations to environmentally focused organizations. Members come from Delaware Department of Natural Resources and Environmental Control (DNREC); the Delaware Department of Agriculture's (DDA) Nutrient Management Program and Planning Section; Delaware Department of Transportation; the US Department of Agriculture's Natural Resource Conservation Service (NRCS), Farm Service Agency (FSA), and Rural Development; the New Castle, Kent, and Sussex Conservation Districts; the University of Delaware's Cooperative Extension Service; Delaware Farm Bureau; Nutrient Management Commission members; and farmers.

9.1 2010 Accomplishments

This section documents the accomplishments and highlights of the State of Delaware during the 2010 calendar year within the Chesapeake Bay Watershed. As noted below, Delaware's agriculture community is committed to reducing nutrient and sediment loads through priority practices and other best management practices.

Table 36: Accomplishments and highlights of the State of Delaware during the 2010 calendar year within the Chesapeake Bay Watershed

<i>Agriculture Practices</i>	Unit	2009	2010	Change
Nutrient Management on Crop	acres	198,625	197,348	-1,277
Enhanced Nutrient Management	acres	0	0	0
NutMan+EnhancedNM	acres	198,625	197,348	-1,277
Nutrient Management on Pasture	acres	0	0	0
Continuous NoTill	acres	0	0	0
Other Conservation-Till	acres	116,258	120,563	4,305
Conservation Tillage w/ Continuous NoTill	acres	116,258	120,563	4,305
Cover Crop	acres	23,195	18,229	-4,966
Commodity Cover Crop	acres	0	0	0
Commodity+Cover Crop	acres	23,195	18,229	-4,966
Pasture Alternative Watering	acres	0	279	279
Prescribed Grazing	acres	0	96	96
Precision Intensive Rotational Grazing	acres	0	0	0
Horse Pasture Management	acres	0	0	0
Stream Access Control with Fencing	acres	0	0	0
Pasture Management Composite	acres	0	375	375
Forest Buffers on Fenced Pasture Corridor	acres	0	0	0
Grass Buffers on Fenced Pasture Corridor	acres	0	0	0
Forest Buffers	acres	2,226	2,226	0
Wetland Restoration	acres	592	735	143
Land Retirement	acres	1,098	1,119	21
Grass Buffers	acres	721	739	18

Tree Planting	acres	0	23	23
Carbon Sequestration	acres	0	0	0
Conservation Plans	acres	0	33,888	33,888
Water Control Structures	acres	0	0	0
NonUrban Stream Restoration	feet	0	0	0
Livestock Waste Management Systems	AU	1,774	1,313	-461
Poultry Waste Management Systems	AU	10,640	13,678	3,038
Barnyard Runoff Control	acres	0	24	24
Loafing Lot Management	acres	0	0	0
Livestock Mortality Composting	AU	0	908	908
Poultry Mortality Composting	AU	4,304,336	3,084	*
Manure Transport Outside CBWS	tons	14,747	31,569	16,822
Manure Transport Within CBWS	tons	43,122	11,526	-31,596
Manure Transport	tons	57,869	43,095	-14,774
Poultry Phytase (layers+pullets)	% AU @ % TP reduction	100% @ 21%	100% @ 21%	0
Poultry Phytase (broilers+turkeys)	% AU @ % TP reduction	100% @ 16%	100% @ 16%	0
Dairy Precision Feeding	% AU @ % TN reduction	0	0	0
Dairy Precision Feeding	% AU @ % TP reduction	0	0	0
Ammonia Emission Reductions	% AU @ % TN reduction	0	13.2% @ 50%	13.2%
Resource Practices				
Forest Harvesting BMPs	acres	2,070	4,059	1,989
Dirt&Gravel Road E&S (feet)	feet	0	0	0

*Jurisdictions transitioned to reporting progress through the National Environmental Information Exchange Network (NEIEN) in 2010 and some practices require additional attention to ensure that data is appropriately submitted and credited.

9.2 New Programs

The Delaware Agriculture community is committed fulfilling the obligation of the Chesapeake Bay Watershed Implementation Plan. To do so, early efforts were undertaken in 2010 and 2011 to assure progress to meeting the goals of the Plan. The section below highlights some of these efforts:

9.2.1 Strategic Watershed Action Team Project

Funding:

- NRCS \$182,889
- DNREC: \$20,000
- Kent Conservation District: \$15,000
- New Castle Conservation \$15,000
- Sussex Conservation District \$10,963 (in-kind)

Goals: Through 2011, increase nutrient management planning capacity within Sussex and Kent County including the Chesapeake Bay Watershed.

In 2011, two Strategic Watershed Action Team (SWAT) planners were hired by the Sussex Conservation District as part of an agreement between the USDA - NRCS, DNREC-Division of Watershed Stewardship, and the Kent and New Castle Conservation Districts. NRCS was the lead agency in securing the funding for this project with cash and in kind contributions from the other agencies. The two SWAT planners are stationed in the Sussex Conservation District office but will have statewide responsibility in the Chesapeake Bay Watershed. The SWAT planners were hired to complete 112 Comprehensive Nutrient Management Plans (CNMP) in the watershed over the next two years.

9.2.2 Broad Creek Watershed – Targeted Cover Crop Program

Funding: \$200,000

Goals: Initiate a cost share program to increase high nutrient removing cover crop implementation within a sub-watershed of the Chesapeake Bay.

The Sussex Conservation District implemented a pilot program during its FY 2012 cost-share year to encourage early planting of rye on corn ground that has received manure in the Broad Creek Watershed. The District allocated \$200,000 for the Broad Creek Watershed project and increased the incentive rates for this project to \$60 per acre, an increase of \$20 per acre. The cap, or maximum amount of cost-share a farmer can receive for participating in this program was also double that of the District's traditional program. The purpose of the project was to see if the increased incentive was enough to encourage farmers to plant Rye (the most efficient cover crop species) to maximize nutrient uptake and push us closer to our WIP implementation goals. In the first year of the pilot project, 3,064 acres were enrolled in the program, obligating \$146,408.

9.2.3 Chesapeake Bay Cover Crop Initiative

Funding: \$425,000

Goals: To increase cover crop implementation within the Chesapeake Bay Watershed.

Through a USDA, Natural Resources Conservation Service, Contribution Agreement, the Sussex Conservation District will partner with NRCS to assist with Farm Bill implementation, and education and outreach efforts in Sussex County. As part of this agreement, additional funding was allocated for the implementation of cover crops in the Chesapeake Bay Watershed. In the 2011 agreement, NRCS provided \$425,000 for early planted cover crops in the watershed. In addition, the District's conservation planners assist with EQIP applications, rankings, and contracts, as well as developing CNMPs.

9.2.4 Fish and Wildlife Foundation Grant

Funding: \$848,424

Goals: Using excess manure to generate farm income in the Chesapeake's phosphorous hot spots

Initiating in 2011, this project will reduce excess land application of manure in four of the Chesapeake's "phosphorus hot spots" by accelerating adoption of innovative manure-to-energy technologies and the creation of marketable fertilizer products that generate farm income. The Initiative will close the knowledge gap regarding viable manure-to-energy technologies, provide direct assistance to farmers and agricultural communities in identifying technologies that best meet their needs, and will facilitate grant funding and financing to design and implement four new manure-to-energy projects that are cost effective both at

producing energy and reducing nutrient pollution to the Chesapeake Bay. The Initiative will be coordinated with state NRCS management teams and program specialists, investors, farmers, nongovernmental organizations, and academic institutions.

9.2.5 Maryland Association of Soil Conservation Districts, Inc. Project

Funding: \$73,500

Goals: Conservation Outreach to Non-English Speaking Poultry Growers

Beginning in 2011, this project will provide critical information on CAFO, MAFO, CNMO, routine maintenance procedures of installed best management practices, related water quality information, and information on federal and state stewardship cost-share programs by translating it into Korean and Vietnamese. The Maryland Association of Soil Conservation Districts will partner with poultry experts with the University of Maryland Extension, Mid-Atlantic Farm Credit, Delmarva Poultry Industry and Korean and Vietnamese community leaders to select the publications, fact sheets and other appropriate material to be translated and mailed to Korean and Vietnamese growers. The publications will be made available to Delaware growers through the local NRCS Field Offices.

9.2.6 AviHome, LLC Project

Funding: \$1,000,000

Goals: Commercial Demonstration of the Reduction of Ammonia (NH₃) Production and other Environmental Benefits in Poultry Houses through use of a Plenum Flooring System

Beginning in 2011, this project will demonstrate an innovative and highly effective flooring system for reducing ammonia emissions in chicken houses. Approximately 9 billion broilers (chickens raised for meat production) are raised in the United States (US) annually producing approximately 25 billion pounds of manure. Broiler house floors have several types of material that is used to absorb/ disperse the manure moisture. In the broiler houses ammonia is produced by a natural chemical reaction in the feces and released. High levels of ammonia could be detrimental to the environment, broiler health and human health. After many years of engineering and testing, special flooring has been developed by AviHome to replace the litter as the base of the floor to rear broilers.

9.2.7 Delaware Rural Irrigation Program

Funding: \$1,000,000

Goals: To increase irrigation usage within Delaware.

The Delaware Rural Irrigation Program (DRIP) Revolving Loan Fund, administered collaboratively through the Delaware Department of Agriculture and the Delaware Economic Development Office, is a revolving no-interest loan fund available to qualified Delaware farmers to add new irrigation systems including center pivot, linear move, towable systems, span angle systems, corner arm systems, single phase systems or wells and filters associated with drip irrigation systems. The goal is to significantly increase the amount of irrigated cropland in Delaware.

This new program established in 2011 works in partnership with any private lending institutions by providing the borrower with no-cost capital equal to the normal and customary equity requirements of a private loan.

The loan fund would finance up to 25% of the total project cost, not to exceed \$25,000, at zero interest for a term of no longer than seven years with repayment of principal beginning in year three of the loan. A bank or other lending institution must loan the remaining balance of the project.

Eligibility requirements include:

- Farmers must be actively engaged for at least two years in the growing and harvesting of cash crops such as corn, soy beans, fruits and vegetables in Delaware.
- Farmers must own or lease the land to be irrigated.
- The existing non-irrigated land must be located in the State of Delaware to grow crops.
- Funds may be used to drill new well(s), acquire power units and to fabricate and install new irrigation systems.
- All work must be performed by experienced and qualified contractors licensed by and located in the State of Delaware.
- Project financing is limited to one project per individual farm annually.

9.3 Current Programs and Capacity

Since the baseline period, the agriculture community in Delaware has reduced a significant amount of nonpoint source nitrogen and phosphorus loading, leading the efforts to curtail nonpoint source nutrient loadings. The existing programs to address conservation efforts and water quality protection on agricultural lands within the State are described below.

9.3.1 Delaware's Nutrient Management Program

Nutrient management is an issue of importance for farmers, nutrient handlers, state officials, federal officials, and the general public. With water quality at stake, accountability for nutrient use is now a heightened concern. In 1999, the [Nutrient Management Law](#), which mandates that all farmers, golf courses, and other nutrient handlers develop and implement phosphorous-limiting nutrient management plans, maintain nutrient handling records, maintain nutrient certification, and submit an annual report, was passed and resulted in the Delaware Nutrient Management Program. The Delaware Nutrient Management Commission (DNMC) was formed to direct the Program and develop regulations pertaining to nutrient management, waste management for Animal Feeding Operations (AFOs), and National Pollutant Discharge Elimination System (NPDES) permits for concentrated animal feeding operations (CAFOs). The Commission is composed of fifteen voting members and four ex-officio members. The voting members include seven full-time farmers, one commercial/agricultural nutrient applicator, one member of the commercial nursery industry, one golf course/lawn care industry representative, two members from one or more environmental advocacy groups, one nutrient consultant, one public citizen, and a representative of DNREC. To clarify, the NPDES CAFO program is administered by DNREC and managed by DDA. The DNMC serves an advisory role.

The DNMC continues to implement agreements with Delaware poultry companies (Allen's, Mountaire, and Perdue), resulting in the incorporation of the phytase enzyme in all feed, which helps poultry digest P and reduces the amount in litter. Phytase and other litter/manure amendments and handling practices have reduced the P content in litter by 20-30% and perhaps up to 40%. Poultry company agreements have also led to increased nutrient management education, certification, and stewardship, and additional funding for the Nutrient Relocation Program. The DNMC covers education credits in addition to agriculture credits.

The DNMC administers the nutrient management training, education and certification program. Both the DNMC and DDA continue to view education as a priority for compliance, protection of water quality and many other nutrient related topics, and utilize the University of Delaware Extension and agribusinesses to educate nutrient handlers. It serves as an integral component of our regulatory compliance strategy. As farmers and other nutrient handlers become certified and continue to meet educational requirements, better nutrient handling decisions are made. The DNMC has issued over 2,700 certifications since 2004. Currently 1,683 different nutrient management certificates are maintained by the program. Maintenance of nutrient management certification is mandatory for all nutrient generators, handlers, and consultants/planners in Delaware. Certification includes class room instruction and passage of rigorous examinations.

The Nutrient Management Law controls the minimum set of management practices that are included in nutrient management plans. In regard to phosphorus in soils, it is important to note that Delaware's NMP's are p-based and have been for many years. The application of phosphorus is limited on high phosphorus soils, and utilizes a three year crop removal policy to restrict p-application in certain conditions on high p-soils. High phosphorus soils are determined based on the P-Site Index analysis. In the absence of phosphorus data, yield based assessments are conducted using the four highest yield goals out of the last seven years. In addition to the phosphorus and nitrogen limiting plans, Delaware has a manure relocation program aimed at reducing phosphorus in soils. To obtain appropriate agronomic rates for application of manure, biosolids, and organic byproducts, the Nutrient Management Plan incorporates soil testing, manure testing, phosphorus index, and crop needs. Delaware allows three and one year NMPs, with the majority being one year plan. In addition, feedback from NMP writers indicate that most Delaware's producers and NM Consultants are utilizing yearly soil test data regardless of plan length. Winter

application of nitrogen and phosphorous nutrients (organic or chemical based) is not permitted between the dates of December 7th and February 15th.

Penalties for noncompliance with the provisions outlined in the Nutrient Management Law are listed within State of Delaware Code Title 3 Chapter 22, Nutrient Management Law Subchapter V. Enforcement, Suits for Enforcement, and Incentives. Fines range from \$50 to \$1,000 per violation. Final fines and penalties are addressed through the Delaware Nutrient Management Commission. Compliance audits are conducted in response to complaints made to the Delaware Nutrient Management Program.

9.3.1.1 Gap Analysis

The number of DDA Nutrient Management Program staff has increased by hiring two new positions and filling a position which had been vacant for three years due to a hiring freeze. One of the new positions resulted from transferring a vacant position from another section within DDA and then reclassifying that position. Another position was made possible through the Chesapeake Bay Regulatory and Accountability Program Grant funds. Since previous funding was cut, resources will be needed to administer the new CAFO regulations and help support additional BMP implementations.

DDA plans to further utilize existing staff in other operational sections to assist with implementation of the nutrient management related operations including CAFO. This job sharing or resource sharing strategy will result in a 1.5 position equivalent increase. The increased staffing within the Nutrient Management Section has already resulted in a significantly increased pace of processing NOIs for CAFO permits.

Delaware communicated to EPA in our 106 Grant work plan, that we need feedback from EPA on language regarding a proposal to discharge in our regulations, since nationally a court decision has ruled against this.

9.3.1.2 Strategy to Fill Gaps

Delaware is already working with partners and has a fully funded and successful nutrient management handler certification program that requires a minimum amount of credit hours for all nutrient handlers, including generators, applicators, consultants, and planners. The Delaware Nutrient Management Commission (DNMC) is highly respected in the agricultural community, and facilitates partnerships among all applicable state and local agencies as well as academic institutions and land grant universities. The NMC engages in full public information initiatives for all nutrient handlers, not just agricultural handlers. Agriculture Week ([Ag Week](#)) consolidates farm-based educational meetings while recognizing and celebrating the industry's importance. The University of Delaware Cooperative Extension, Delaware State University Cooperative Extension, and Delaware Department of Agriculture are cooperating with many partners to organize the week of agriculture related events.

To address historical phosphorus accumulation in soils that will contribute future loads to the Bay, Delaware is considering further limiting phosphorus from high phosphorus soils. On February 2, 2012, the Delaware Department of Agriculture hosted a P-Site Index Summit. The summit included stakeholders from academia, EPA, NRCS, DDA, DNREC, the Delaware Nutrient Management Commission, the poultry industry, and others. We reviewed the current Maryland P-Index and their plans to update the index. We reviewed Delaware's P-Index. In addition, we reviewed and discussed NRCS's guidance for updating the 590 standard and the links between that update and our P-Index. Both DDA and DNREC are active participants in the work group tasked with updates to the 590 standard. As those updates progress, DDA will continue to assess the need to update our P-Site Index.

9.3.2 Oversight of AFOs and CAFOs

The Delaware CAFO regulations and program are promulgated and implemented under the authority of DNREC (7 Del.C. 60) and the Nutrient Management Program (3 Del.C. 2200). DNREC is the EPA delegated agency charged with NPDES CAFO oversight and administration. The DDA through a Memorandum of Agreement signed in 2010 with DNREC primarily manages the CAFO program under the supervision of DNREC. In accordance with the MOA, the DDA is the initial point of contact with the regulated community, reviews and makes initial permit determinations, performs most inspections and enforcement actions if warranted, and reviews and makes Nutrient Management Plan (NMP) determinations. In accordance with the MOA, among other activities, DNREC **retains supervision and enforcement authority**, jointly promulgates CAFO regulations, approves final permit issuance and is the Delaware point of contact with EPA. DDA and DNREC are committed to maintaining and updating an MOA to address the roles and responsibilities of both parties as appropriate for programmatic oversight. DDA and DNREC along with NRCS and other stakeholders worked collaboratively to evaluate federal requirements for state CAFO permits and update state CAFO regulations. Delaware's regulations were first revised in 2010, but EPA expressed concerns as related to definitions and inspection protocols in the 2010 version of the regulations. Delaware's newly revised CAFO regulations were published in the [State Register of Regulations](#) on November 1, 2011 and became effective November 11, 2011.

In accordance with the new state CAFO regulations, animal feeding operations (AFOs) include any operation in which animals have been, are, or will be stabled or confined, fed, or maintained for a total of 45 days or more in any twelve month period. The confinement area must not sustain crops, vegetation, or forage growth, and post residues, such as corn stubble left over after a crop is harvested, cannot be sustained in the normal growing season. Two or more animal feeding operations under the same ownership are considered to be one operation if the production areas adjoin each other or if they use a common area or system for the disposal of manure or wastes. Initially, animal feeding operations determine their need to obtain permit coverage in accordance with the State's CAFO regulations. Through inspections, DDA and/or DNREC may also require an AFO to seek a CAFO permit. DNREC and DDA have also made [EPA's CAFO Duty to Apply Guidance](#) available to the regulated community to help owners and operators assess their need to apply for a CAFO permit. We will make adjustments in the guidance provided to our agricultural community as EPA adjusts their published guidance documents.

Table 37: An AFO is considered to be a Large CAFO if the number of animals equals or exceeds:

Quantity	Species
1,000	Cattle other than mature dairy cows or veal calves. Includes but is not limited to heifers, steers, bulls, and cow/calf pairs
700	Mature dairy cattle (whether milked or dry cows)
2,500	Swine each weighing over 55 pounds
10,000	Swine weighing under 55 pounds
500	Horses
10,000	Sheep or lambs
55,000	Turkeys
30,000	Laying hens or broilers, if the AFO uses a liquid manure handling system
125,000	Chickens except laying hens (if other than a liquid manure handling system)
82,000	Laying hens (if other than a liquid manure handling system)
1,000	Veal calves

30,000	Ducks (if the AFO uses other than a liquid manure handling system)
5,000	Ducks (if the AFO uses a liquid manure handling system)

Table 38: An AFO is considered to be a Medium CAFO if the operation does or will directly or indirectly discharge pollutants and the number of animals equals or exceeds:

Quantity	Species
300-999	Cattle other than mature dairy cows or veal calves. Includes but is not limited to heifers, steers, bulls, and cow/calf pairs
200-699	Mature dairy cattle (milked or dry cows)
750-2,499	Swine each weighing over 55 pounds
3,000-9,000	Swine weighing under 55 pounds
150-499	Horses
3,000-9,999	Sheep or lambs
16,500-54,999	Turkeys
9,000-29,000	Laying hens or broilers, if the AFO uses a liquid manure handling system
37,500-124,999	Chickens except laying hens (if other than a liquid manure handling system)
25,000-81,999	Laying hens (if other than a liquid manure handling system)
300-999	Veal calves
10,000-29,999	Ducks (if the AFO uses other than a liquid manure handling system)
1,500-4,999	Ducks (if the AFO uses a liquid manure handling system)

In February 2010, Delaware had only twenty-four (24) NPDES CAFO permitted operations. As a result of an extensive educational push by DDA, DNMC, and EPA in the winter/spring of that year, and further educational efforts this last summer, Delaware now has 382 CAFOs going through the permitting process with 237 located in the Chesapeake Bay Watershed. Table 39 provides a breakdown of the types of CAFOs in Delaware. We believe that most of operations or sources subject to NPDES regulations have submitted NOIs. Over half of the submitted NOIs have undergone a field assessment by DDA staff as the first step of processing those NOIs. Please note that DNREC retains authority under 7 Del.C. Chapter 60 to conduct inspections and enforce these NPDES regulations. In accordance with the Nutrient Management Law, Nutrient Management Plans are valid for no more than 3 years. The Nutrient Management Program, dependent upon staffing levels, has a goal to inspect every facility with a Nutrient Management Plan at least once during its lifecycle, therefore, at a minimum of three years. With current staffing levels in place or anticipated by the end of 2011, this is a reasonable and achievable goal. Section 6.1.1.6 of the revised Delaware CAFO regulation states that violations of the terms of the nutrient management plan or animal waste management plan incorporated into the NPDES CAFO permit shall constitute a violation of the NPDES CAFO permit. Section 6.1.1.7.2 requires emergency notification of discharges, which will trigger an inspection or assessment. Nutrient Management Plans revised every three years will be re-evaluated by the Secretary for compliance with permit conditions.

The 2008 federal CAFO rule has ability to assess fines up to \$5,000 per violation/day for civil violations or \$10,000 per violation/day. Delaware law would need to be changed in order to meet these minimum fine requirements.

Table 39: Number of Delaware CAFO Permits, 2011

Total active CAFO permit applicants	382
Poultry-broiler farms	365
Dairy farms	12
Horse farms	1
Beef farm	2
Swine farm	1
Poultry-layer farm	1
Total inactive CAFO permits	2
Number of poultry farms over 125k capacity	61
Permit coverage within the Chesapeake Bay	
Poultry farm	229
Beef farm	2
Dairy farm	6
Complete CAFO files	34
Incomplete CAFO files	348
Manure generation and exported	94
Manure generation and land applied	151

As part of the CAFO regulation redrafting process, all best management practices (BMPs) or State Technical Standards (STSS) have been evaluated. The State Technical Standards Committee starting meeting in 2010, and reviewed all current BMPs. Many of the existing STSS were updated and others when gaps were identified new STS were drafted and peer reviewed. Those standards (approximately 50) are posted on DDA's websites at: http://dda.delaware.gov/nutrients/NM_TechStandards.shtml

EPA conducted a preliminary review of the standards and commented on a handful. Additional information was requested on those standards and that information was submitted earlier in 2011. Currently, EPA has communicated that they will further review the following standards related to the application area.

- Conservation Practice Standard - Nutrient Management (Code 590)
- Conservation Practice Standard - Phosphorus Site Index
- Conservation Practice Standard - Manure Incorporation
- Conservation Practice Standard - Manure Testing
- Conservation Practice Standard – Soil Testing Procedures

The STSS are policy documents and as such are always open for public comment. The Committee can and has convened to review public comments when submitted or the need to re-evaluate a standard is revealed.

9.3.2.1 Gap Analysis

Although the CAFO regulation is recently promulgated, there is full nutrient management compliance. Compliance is assessed through a comparison of the land area enrolled in cost share for NM planning with the acreage in agriculture.

9.3.2.2 Strategy to Fill Gaps

Delaware will identify the number of animals confined in CAFOs by county. Almost the entire population of animals in CAFOs has NPDES permits; there are 382 currently being permitted statewide, and 61 of them are large poultry farms. (At the time of this update, there are actually over 400 NOIs with more coming in every week.) The DDA does not expect the number of poultry operations in the Chesapeake to increase between now and 2025.

The DDA, the DNMC, and DNREC have been working with EPA over the last year to prepare for modifying the State's current CAFO regulations in response to changes in the federal regulations. The regulations are now final and are currently available for review on DDA's and DNREC's websites. The regulations will result in a higher level of management for permitted CAFOs, almost identical to federal regulations. As a result of the modified regulations, medium-sized CAFOs and poorly managed AFOs of any size will also be covered under the CAFO regulations. Animals confined by CAFOs that currently do not have NPDES permits will be permitted soon. Permits will be reviewed once every five years, with the attached NMP required to be reviewed every three years at a minimum.

Additional controls may also be required. State Technical Standards, BMP manuals, permitting strategies, minimum practice requirements within a nutrient management plan, and/or contract conditions for receiving cost-share assistance are currently being modified. The State Technical Standards have been modified and are currently under EPA review. To assure that adequate resources are available for the rewriting of State Technical Standards, Delaware will rely on EPA and USDA grants to provide additional necessary funds. Two new positions and the filling of a long vacant position for the nutrient management program will benefit from these funds, as well as from restoration of state general funds for nutrient planning reimbursements.

Since 2000, all DE Nutrient Management Plans (NMP) are required to be P based. Delaware is proposing to use the NRCS Nutrient Management Code 590 within the nutrient management plan requirements. This standard provides information on managing the amount, source, placement, form, and timing of the application of nutrients and soil amendments. Code 590 serves multiple purposes: to budget and supply nutrients for plant production, to properly utilize manure or organic by-products as a plant nutrient source, to minimize agricultural non-point source pollution of surface and ground water resources, and to maintain or improve the physical, chemical, and biological condition of soil. The use of Code 590 is new, and augments the Nutrient Management Law on CAFOs, which does not cover the elements in as great of detail. Delaware uses an animal waste management plan that includes the nine elements required by EPA for nutrient management planning.

To verify that controls are installed and maintained, CAFO permits will be monitored at a frequency that will be agreed upon between EPA and Delaware through the 106 work plan process. It is anticipated that (1) compliance inspections of all permitted CAFOs will occur at least once every five years, (2) CAFO determination inspections of all unpermitted large CAFOs and all medium AFOs will be conducted as complaints warrant, and based on the Secretary of Agriculture's yet to be determined schedule and (3) on-site visits of AFOs for the purpose of evaluating criteria for designation will be conducted as warranted. The Nutrient Management Program, dependent upon staffing levels, has a goal to inspect every facility with a Nutrient Management Plan at least once during its lifecycle, therefore, at a minimum, once every three years. It is important to note that most NMPS in Delaware are one year plans and as such are assessed yearly. With current staffing levels in place or anticipated by 2012, this is a reasonable and achievable goal. The Nutrient Management Program staff will perform all compliance inspections of AFOs and most inspections of permitted and unpermitted CAFOs as warranted. Like DNREC, the DDA NM Program staff follows an education program before regulating the compliance strategy. When fines and or penalties are warranted and appropriate, Del. C., Title 7, Chapter 60 sets out the schedule.

9.3.3 Nutrient Planning Program

Agency: Delaware Department of Agriculture
Contact: W. Larry Towle
Title: Nutrient Management Program Administrator
Address: 2320 South Dupont Highway
Dover, Delaware 19901
Phone: (302) 698-4500
Web Page: http://dda.delaware.gov/nutrients/nm_cs.shtml

Type of Program: Funding, Technical Services, Outreach/Education

Number of Technical Staff: 3 (2 state general funded positions and 1 grant funded)

Number of Administrative Staff: 2

Program Description: Proper application of nutrients to farmland and urban turf areas is vital to prevent the runoff of excess nutrients into the waters of Delaware. The Nutrient Planning Program provides financial reimbursement to farmers and property managers for the writing of nutrient management plans for farms, golf courses and urban turf facilities. The application process validates eligible nutrient applicators and plan writers. In 2011, the program provided reimbursement for 143 nutrient management plans written by private consultants. Such plans covered 94,581 acres. In addition, plans written in previous years and still in effect covered another 206,063 acres for a total of 300,644 acres

Agriculture BMPS Offered: Nutrient Planning

Compliance Rates: NA

Chesapeake Bay Annual Budget: \$170,201

Chesapeake Bay Annual Accomplishments (2011): \$552,185

Future: Currently 100% of Delaware farmland is covered by a nutrient management plan. Further reductions in nutrient runoff may be achieved by continued research into manure application and handling as well as increased outreach to help farmers implement their plans.

Gap Analysis: Currently 100% of Delaware farmland is required to have a nutrient management plan written by a certified plan writer. The Delaware Nutrient Management Commission is the certifying entity.

Further reductions in nutrient runoff may be achieved by continued research into manure application and handling as well as increased outreach to help farmers implement their plans. Furthermore, the development and implementation of additional and new BMPs are expected to improve nutrient use efficiency and lessen nutrient runoff. Under EPA direction, DDA is spearheading an effort to assess and re-draft when necessary the State Technical Standards (BMPs) for nutrient handling and environmentally conscience farm operation.

9.3.4 Nutrient Relocation Program

Agency: Delaware Department of Agriculture
Contact: W. Larry Towle
Title: Nutrient Management Program Administrator
Address: 2320 South DuPont Highway
Dover, Delaware 19901
Phone: (302) 698-4500
Web Page: http://dda.delaware.gov/nutrients/nm_reloc.shtml

Type of Program: Funding, Technical Services, Outreach/Education

Number of Technical Staff: 3 (2 state general funded positions and 1 grant funded)

Number of Administrative Staff: 2

Program Description: The Relocation Program provides financial reimbursement to farmers, brokers, and trucking businesses for the transportation cost of relocating litter from a Delaware farm to an alternative use project or another farm for land application. The application process validates eligible senders, receivers, truckers, and alternative use projects. Excess litter continues to be transported for land application throughout Delaware as well as Maryland, New Jersey, and Virginia. Alternative use projects are also essential for managing excess poultry litter. In 2011, 111,669 tons of excess poultry litter were relocated, for a ten year total of over 766,700 tons. Over 50% of the excess litter went to alternative use projects such as the Perdue AgriRecycle fertilizer plant in Blades, DE. The plant processed over 56,000 tons in 2011, 26,000 tons being Delaware-generated.

Agriculture BMPS Offered: Nutrient Relocation

Compliance Rates: NA

Chesapeake Bay Annual Budget: \$277,200

Chesapeake Bay Annual Accomplishments (2011): \$277,200

Future: Dependent upon funding.

Gap Analysis: This program is dependent on funding and it is impossible to have too much funding for this program. If there are funds, manure will be moved. Funding sources have already been diversified. If more stringent phosphorus manure application recommendations or requirements are developed in the State, this could limit the ability to transport and apply manure to other agricultural lands in the Chesapeake portion of the State and may require that more is transported out of Chesapeake watershed or to alternative uses, which could be more expensive. The Delaware Nutrient Management Commission currently monitors application rates and will be in the position to continue monitoring any change recommendations or requirements for application rates in the future.

9.3.5 Kent Conservation District Cost-Share Program

Agency: Kent Conservation District
Contact: Timothy M. Riley
Title: District Coordinator
Address: 800 Bay Road, Suite 2, Dover, DE 19901
Phone: (302) 741-2600 ext 3
Web Page: www.kentcd.org

Type of Program: Cost-Share funding, Technical Assistance, Outreach/Education

Number of Technical Staff: Three Conservation Planners, One Survey Technician plus cooperative agreement with USDA-NRCS for work with Kent County District Conservationist & Two Conservationists, and an NRCS Survey Technician

Number of Administrative Staff: Three

Program Description: The Kent Conservation District Cost-Share Program assists landowners and land managers with design and installation of site-specific conservation practices on their property within Kent County, Delaware. A site visit by a KCD planner, a completed application, and approval from the Board of Supervisors is required prior to construction. The cost-share rates and limitations vary according to the practice; cost-share rates range from 25-75%.

Agriculture BMPS Offered: KCD's cost-share program can provide financial and/or technical assistance for any agricultural best management practice as approved by the KCD's Board of Supervisors. Examples of these BMPs include, but are not limited to:

Water Management Practices

- Open Ditching
- Tile Drainage
- Land Grading and/or Smoothing

Animal & Agricultural Waste Management Systems

- Poultry Composter
- Poultry Manure Storage Structure
- Dairy Waste Systems
- Equine Manure Storage Structure
- Animal & Agricultural Waste Handling Equipment
- Heavy Use Area Protection (Concrete Pads) for Poultry
- Equine Manure Dump Wagons
- Spray Irrigation Equipment
- Heavy Use Area Protection for Dairy

Water Quality Practices

- Drainage Ditch Impoundments
- Ponds – NRCS Type 3 CRP, CP3A & CP23

Erosion and Sediment Control Practices

- Water and Sediment Control Basins
- Critical Area Treatment
- Erosion and Sediment Control Structures
- Sod Waterways

- Windbreaks

Chesapeake Bay Annual Budget: For FY-2011 KCD received \$450,000 total funding for Cost-Share practices, \$35,000 in Chesapeake Bay Funds and \$50,000 in USDA-NRCS funding for Cover Crops. Of this, an approximate total of \$312,620 will be spent in the Chesapeake Bay Watershed. The budget breakdown is:

Cover Crops	\$157,000
Water Management Practices	\$3,500
Animal & Agricultural Waste Management Systems	\$100,000
Water Quality Practices	\$3,000
Erosion and Sediment Control Practices	\$6,000
Administrative & Technical Assistance	\$43,120

Chesapeake Bay Annual Accomplishments (2010): For FY-2010 KCD received \$400,000 total funding for Cost-Share practices, an additional \$35,000 in Chesapeake Bay Funds and \$50,000 in USDA-NRCS funding for Cover Crops. Of this, an approximate total of \$265,048 was spent in the Chesapeake Bay Watershed. The budget breakdown is:

- Cover Crops (4,910.62 acres) \$114,440
- Water Management Practices \$3,500
- Animal & Agricultural Waste Management Systems \$110,550
- Water Quality Practices \$0
- Erosion and Sediment Control Practices \$0
- Administrative & Technical Assistance \$36,558

BMP Implementation realized with the above funding:

BMP	Number	Unit
Poultry Heavy Use Area Protection	17	Pads
Poultry Manure Structures	1	Each
Manure Spreaders	1	Each
Front-end Loaders	1	Each
Cover Crops	4,910	Acres
Tile Drainage	3,013	Feet

Gap Analysis: KCD will continue to promote its Cost Share Program to all of Kent County, including the Chesapeake Bay watershed. Currently, cover crops are the number one priority of the KCD Cost Share Program. Sign-ups for cover crops are offered for two weeks in August since they are only planted during the fall. All other cost share applications are accepted throughout the year. These producers go on a waiting list and once all cover crop requests are funded, if there is cost share funding remaining, District staff call the producers on the waiting list to determine if they are still interested in the BMP. Due to this process, it is difficult to quantify the funding gap(s) for the KCD Cost Share Program, but this waiting list which has been present for at least the past 7 years, demonstrates that more BMPs are requested than funding allows for installation. This list and BMPs requests varies and at any given time, the waiting list can contain requests for \$3,500 to \$425,000 in total cost share requests. If additional funds are available, the time spent on the waiting list will shorten and more implementation will occur.

Strategy to Fill Gaps: KCD will continue to promote its Cost Share Program to all of Kent County, including the Chesapeake Bay watershed. Currently, cover crops are the number one priority of the KCD Cost Share Program. Sign-ups for cover crops are offered for two weeks in August since they are only planted during the fall. All other cost share applications are accepted throughout the year.

For FY2011 KCD received \$450,000 total funding for Cost-Share practices, \$35,000 in Chesapeake Bay Funds and \$50,000 in USDA-NRCS funding for Cover Crops. Of this, an approximate total of \$312,620 will be spent in the Chesapeake Bay Watershed. The budget breakdown is:

- \$157,000 - Cover Crops
- \$3,500 - Water Management Practices
- \$100,000 - Animal & Agricultural Waste Management Systems
- \$3,000 - Water Quality Practices
- \$6,000 - Erosion and Sediment Control Practices
- \$43,120 - Administrative & Technical Assistance

9.3.6 Sussex Conservation District Cost-Share Program

Agency: Sussex Conservation District
Contact: Debbie Absher
Title: District Coordinator
Address: 21315 Berlin Road, Unit 4
Georgetown, Delaware 19947
Phone: (302) 856-3990, ext. 110
Web Page: www.sussexconservation.org

Type of Program: Cost-share funding, technical assistance, outreach and education

Number of Technical Staff: 8 technical staff (5 planners, 2 SWAT planners*, and 1 compliance inspector)

**Two Strategic Watershed Action Team (SWAT) planners were hired by the Sussex Conservation District as part of an agreement between the USDA - NRCS, DNREC-Division of Watershed Stewardship, and the Kent and New Castle Conservation Districts. NRCS was the lead agency in securing the funding for this project with cash and in kind contributions from the other agencies. The two SWAT planners are stationed in the Sussex Conservation District office but will have statewide responsibility in the Chesapeake Bay Watershed. The SWAT planners were hired to complete 112 Comprehensive Nutrient Management Plans (CNMP) in the watershed over the next two years.*

Number of Administrative Staff: 3

Program Description: The Sussex Conservation District Cost-Share Program provides financial assistance to landowners to implement best management practices to improve or enhance water quality and other natural resource concerns. A conservation/SWAT planner will conduct an on-farm visit to assess the resource concerns on the farm. The planner will then develop a conservation plan and make recommendations on how to address those concerns. The Sussex Conservation District holds an annual sign-up for usually two weeks during the month of August. Once the applications for cost-share assistance are received, the applications are ranked and presented to the Board of Supervisors for approval. Cost-Share approval must be received before construction or implementation of the conservation practice can begin. When the practice is completed, the landowner will bring in the bills for reimbursement. The cost-share rates range from 50% to 75% depending on the practice.

Agriculture BMPs Offered: The Sussex Conservation District can provide financial assistance for the following best management practices as approved by the SCD Board of Supervisors and the Director of the Division of Watershed Stewardship:

Erosion Control

- Permanent Vegetative Cover
- Field Terraces
- Diversions
- Field Windbreak
- Critical Area Plantings
- Water and Sediment Control Basins
- Grade Stabilization Structures

- Grassed Waterways
- Poultry Windbreaks
- Shoreline Stabilization

Animal Waste Systems

- Agricultural Waste Control Systems
- Roofed Animal Waste Structures
- Ag Composting Facilities
- Poultry Incinerators
- Heavy Use Area Protections
- Additions to Existing Structures
- Access Roads
- Roof Runoff Structure

Water Management

- Water Control Structures

Wildlife Habitat Development

- Wildlife Plantings
- Wildlife Ponds
- Constructed Wetlands

Cover Crops

Compliance Rates: The Sussex Conservation District has a compliance inspector on staff to conduct inspections of all BMPs in the county. Since hiring this inspector, program compliance has increased significantly. An estimate of the compliance rate is about 85% for those conservation practices within the lifespan of the contract. When a landowner is found to be out of compliance, the inspector begins an education process. If the landowner refuses to bring the practice into compliance, then a series of letters are sent out requiring repayment of cost-share and informing the participant that they will not be able to participate in future programs.

Chesapeake Bay Annual Budget: In FY 2012, the Sussex Conservation District had \$597,907 earmarked specifically for cover crops in the Chesapeake Bay Watershed. County-wide, SCD had \$816,465 allocated in which a portion of that also went to the Chesapeake Bay.

Chesapeake Bay Annual Accomplishments (2010): SCD cost-shared on the following practices in the Chesapeake Bay Watershed during calendar year 2010:

Conservation Practice	Number	Cost-Share
Cover Crops	18863	\$ 527,336.00
Wildlife Pond	1	\$ 2,913.00
Diversion	1	\$ 1,157.00
Total		\$ 531,406.00

Future: In order to achieve the Chesapeake Bay Watershed TMDL targets, additional funding will be needed. If funding were not an issue, the Sussex Conservation District could spend the following (based on our FY 2012 cost-share enrollment):

Conservation Practice	Number	Cost-Share
Cover Crops	70800	\$ 2,832,000.00
HUAPs	25	\$ 118,320.00
Poultry Manure Structures	1	\$ 19,176.00
Poultry Composters	1	\$ 3,750.00
Wildlife Ponds	1	\$ 3,000.00
Poultry Windbreak	1	\$ 4,260.00
Total		\$ 2,980,506.00

Other Accomplishments: Over the past two years, the Sussex Conservation District has attempted to bring in additional funding for conservation programs in the Chesapeake Bay through various sources. Below is a description of each effort:

USDA – NRCS – Cooperative Conservation Partnership Initiative (CCPI) – In 2010 and 2011, the Sussex Conservation District submitted project proposals to NRCS for additional financial assistance funds for Poultry Headquarters Water Quality Best Management Practices in the Chesapeake Bay Watershed. Each year, the District was successful and brought in additional funding of \$472,000 (2010) and \$715,000 (2011) for a total of \$1.187 million in conservation practices in Sussex County's portion of the Chesapeake Bay Watershed. For details on the CCPI accomplishments, see NRCS.

Chesapeake Bay Watershed Regulatory and Accountability Grant (CBRAP) – The Sussex Conservation District received funding through this grant to complete compliance inspections on all water quality best management practices (BMP) in Sussex County's portion of the Chesapeake Bay Watershed. These inspections included ensuring that all cover crops are planted and destroyed in a timely manner, and that all structural BMPs are being utilized and maintained for the required lifespan. In 2010-2011, 18,863 acres of cover crops were inspected for planting and destruction. There were also 160 inspections on poultry waste structures and composters within the watershed in 2011.

Also as a part of the Regulatory and Accountability Grant, the Sussex Conservation District received funding for the development of erosion and sediment control plans for agricultural landowners when constructing ag buildings on their property. These plans include a recent aerial photo with property lines, soils, mapped wetlands, floodplains, tax ditch right-of-ways, and setbacks from well locations. The District also provides technical assistance on site location. Once the site location has been determined, then District staff will prepare a conservation plan for erosion and sediment controls to be used during construction of the structure. Once the structure is complete and site is stabilized, District staff will conduct a final closeout inspection.

Sussex Conservation District Cost-Share Program Pilot Project – Broad Creek Watershed - The Sussex Conservation District implemented a one year pilot program during its FY 2012 cost-share year to encourage early planting of rye on corn ground that has received manure in the Broad Creek Watershed. The District allocated \$200,000 for the Broad Creek Watershed project and increased the incentive rates for this project to \$60 per acre, an increase of \$20 per acre. The cap, or maximum amount of cost-share a farmer can receive for participating in this program was also double that of the District's traditional program. The purpose of the project was to see if the increased incentive was enough to encourage farmers to plant rye (the most efficient cover crop species) to maximize nutrient uptake. In the first year of the pilot project,

3,064 acres were enrolled in the program, obligating \$146,408. The overall success, continuation, and potential expansion of this project will be assessed in 2012.

National Fish and Wildlife Federation – Small Watershed Grant – The Sussex Conservation District submitted a grant for \$200,000 for the implementation of the Broad Creek Watershed Pilot Project described above. Unfortunately the grant request was not approved.

Chesapeake Fund - Another grant submitted by the Sussex Conservation District was a request for financial assistance to complete a project that was unfunded by NRCS's Environmental Quality Incentives Program. The request was in the amount of \$129,169, however it was not funded.

USDA, Natural Resources Conservation Service, Contribution Agreement – The Sussex Conservation District has an agreement with NRCS to assist with Farm Bill implementation, and education and outreach efforts in Sussex County. As part of this agreement, additional funding was allocated for the implementation of cover crops in the Chesapeake Bay Watershed. In the 2011 agreement, NRCS provided \$425,000 for early planted cover crops in the watershed. In addition, the District's conservation planners assist with EQIP applications, rankings, and contracts, as well as developing CNMPs.

Gap Analysis: SCD will continue to promote its Cost Share Program to all of Sussex County, including the Chesapeake Bay watershed. Currently, cover crops are the number one priority of the SCD Cost Share Program. Sign-ups for cover crops are offered in the early fall annually.

In order to achieve the Chesapeake Bay Watershed TMDL targets, additional funding is needed. If funding were not an issue, the Sussex Conservation District could spend the following (based on the FY2012 cost-share enrollment data):

Conservation Practice	Number	Cost-Share
Cover Crops	70800	\$ 2,832,000.00
HUAPs	25	\$ 118,320.00
Poultry Manure Structures	1	\$ 19,176.00
Poultry Composters	1	\$ 3,750.00
Wildlife Ponds	1	\$ 3,000.00
Poultry Windbreak	1	\$ 4,260.00
Total		\$ 2,980,506.00

Strategy to Fill Gaps: The Sussex Conservation District Cost-Share Program provides financial assistance to landowners to implement best management practices to improve or enhance water quality and other natural resource concerns. A conservation/SWAT planner will conduct an on-farm visit to assess the resource concerns on the farm. The planner will then develop a conservation plan and make recommendations on how to address those concerns. The Sussex Conservation District holds an annual sign-up. Once the applications for cost-share assistance are received, the applications are ranked and presented to the Board of Supervisors for approval. Cost-Share approval must be received before construction or implementation of the conservation practice can begin. When the practice is completed, the landowner will bring in the bills for reimbursement. The cost-share rates range from 50% to 75% depending on the practice.

In FY2011, the Sussex Conservation District had \$597,907 earmarked specifically for cover crops in the Chesapeake Bay Watershed. County-wide, SCD had \$816,465 allocated in which a portion of that also went to the Chesapeake Bay.

9.3.7 New Castle Conservation District Cost-Share Program

Agency: New Castle Conservation District (NCCD)
Contact: Kevin C. Donnelly
Title: District Coordinator
Address: 2430 Old County Road, Newark, DE 19702
Phone: 302-832-3100 ext 125
Web Page: www.newcastleconservationdistrict.org

Type of Program: Cost-share funding, Technical assistance, Outreach/Education,

Number of Technical Staff: One field inspection & one field planner plus cooperative agreement with USDA-NRCS for work with NC District Conservationist & Conservationist

Number of Administrative Staff: One

Program Description: The New Castle Conservation District Cost-Share Program assists landowners and land managers do design and install site-specific conservation practices on their property within New Castle County. A site visit by a NCCD planner, a completed application, and approval from the Board of Supervisors is required prior to construction. The cost-share rates and limitations vary according to the practice; cost-share rates range from 30-75%.

Agriculture BMPS Offered: NCCD's cost-share program can provide financial and/or technical assistance for any agricultural best management practice as approved by the NCCD's Board of Supervisors. Examples of these BMPs include, but are not limited to:

- Critical Area Treatment Manure Storage Ponds
- Manure Storage Structures
- Composters
- Winter Cover Crops
- Riparian Forest Buffer
- Filter Strips
- Roof Water Management
- Fencing
- Wetland Creation
- Ponds construction (agricultural only)
- Upland Wildlife Habitat Plantings
- Wetland Wildlife Habitat Plantings (agricultural only)
- Tree planting
- Hedgerows
- Windbreaks
- Woodland Improvement
- Wetland Creation or Restoration (agricultural only)
- Grassed Waterways
- Terraces
- Grade Control Structures

- Water and Sediment Control Basins
- Streambank Protection

Chesapeake Bay Annual Budget: (based on last the fiscal year budget)

Chesapeake Bay Annual Accomplishments (2010): The following are NCCD's reported accomplishments within the Chesapeake Bay Watershed:

- | | |
|---|------------------|
| • Amendments for the Treatment of Waste | 348 animal units |
| • Comprehensive Nutrient Management Plans | 1 |
| • Cover Crop | 383.6 acres |
| • Forage Planting | 51.9 acres |
| • Forage Harvest Management | 4 acres |
| • Nutrient Management | 295.1 acres |
| • Residue and Tillage Management, No-Till | 634.1 acres |
| • Surface Drain, Field Ditch | 270 feet |
| • Waste Storage Facility | 1 |
| • Waste Treatment System | 4 |

Cover Crop Program: NCCD and USDA-NRCS have a Cooperative Agreement that provides funding for part-time assistance to USDA by two NCCD employees and additional cost-share funds for cover crop. The Board of NCCD and its Agricultural Advisory Committee are allocating approximately 62% of our FY12 Conservation Cost-share funds for the District's Cover Crop Program. While this program encompasses tillable land outside of the Chesapeake Bay watershed, the Board and Committee are committed to ensuring that NCCD provides its Bay Watershed producers with both Traditional and Commodity Cover Crop programs. These programs are funded slightly above the levels in Kent and Sussex but remain lower than the latest levels set in the State of Maryland's current program.

NCCD is projecting 1,000 acres of cover crop acres in the Bay Watershed for the 2011 planting year. This projection takes into account the extremely wet conditions that exist in NCC. This acreage is consistent with what was achieved in the recent past.

Future: Increased participation in a cover crop program targeted at the Chesapeake Bay watershed will require additional funding. Overall producer participation in government sponsored cost-share programs may be constrained because of the high percentage of tillable land within the Bay watershed that belongs to absentee owners.

Needs: Additional Cost-share funding might provide the needed incentive to increase participation and create programmatic parity with MD's Cover Crop program.

Outreach & Education: The following links include recent editions of NCCD's newsletter and Annual Report and provided detailed information on the District's cover-crop program and BMP implementation:

- <http://newcastleconservationdistrict.org/News/2011%20Summer%20Newsletter.pdf>
- <http://newcastleconservationdistrict.org/News/2010%20Annual%20Report.pdf>

Gap Analysis: Increased participation in a cover crop program targeted at the Chesapeake Bay Watershed requires additional funding. Overall, producer participation in government sponsored cost-share programs may be constrained because of the high percentage of tillable land within the Bay watershed that

belongs to absentee owners. Additional effort will be made to educate these landowners of the available NCCD managed programs.

Strategy to Fill Gaps: The Board of NCCD and its Agricultural Advisory Committee are allocating approximately 62% of our FY12 Conservation Cost-share funds for the District's Cover Crop Program. While this program encompasses tillable land outside of the Chesapeake Bay watershed, the Board and Committee are committed to ensuring that NCCD provides its Bay Watershed producers with both Traditional and Commodity Cover Crop programs. These programs are funded slightly above the levels in Kent and Sussex but remain lower than the latest levels set in the State of Maryland's current program.

The NCCD is projecting 1,000 acres of cover crop acres in the Chesapeake Bay Watershed. This projection takes into account the extremely wet conditions that existed in NCC during the fall 2011. This acreage is consistent with what we have achieved in the recent past.

9.3.8 Natural Resources Conservation Service (NRCS) Delaware

Agency: USDA, NRCS
Contact: Russell Morgan
Title: State Conservationist
Address: 1221 College Park Drive, Suite 100
 Dover De 19904
Phone: (301) 678-4160
Web: <http://www.de.nrcs.usda.gov/about/index.html>

Type of Program: Financial assistance (cost share) and technical assistance

Program Description: Originally established by Congress in 1935 as the Soil Conservation Service (SCS), the National NRCS has expanded to become a conservation leader for all natural resources, ensuring private lands are conserved, restored, and more resilient to environmental challenges, like climate change.

Seventy percent of the land in the United States is privately owned, making stewardship by private landowners absolutely critical to the health of our Nation's environment.

NRCS's natural resource conservation programs help people reduce soil erosion, enhance water supplies, improve water quality, increase wildlife habitat, and reduce damages caused by floods and other natural disasters.

Delaware NRCS Program provides technical consultation and planning assistance to help landowners make beneficial decisions about natural resource management. Secondly, they assist in "conservation implementation" by helping landowners install conservation practices and systems that meet established technical standards and specifications. The third business line is "natural resource inventory and assessment". By collecting, analyzing and providing landowners with natural resource data, the program helps establish the best conservation plans and resource-use decisions for all landscapes. Fourth is, "natural resource technology transfer". The Delaware NRCS develops and distributes a wide array of technology pertaining to resource assessment, conservation planning, and conservation system installation and evaluation. This also includes training, and certification in standards and procedures. The last of the five business lines is "financial assistance". The Delaware Office provides financial assistance to encourage the adoption of beneficial land-treatment practices that conserve and protect our nation's valuable natural resources.

Financial assistance is awarded to those who voluntarily enter into contracts, easements and agreements to conserve natural resources. Financial assistance is provided through cost-share/ incentives, easements, grants and stewardship payments.

NRCS Chesapeake Bay Annual Accomplishments (2010):

- Comprehensive Nutrient Management Planning (written) 69 plans
- Comprehensive Nutrient Management Planning (applied) 25 plans
- Waste Storage Facility 25 systems
- Composting Facility 17 systems
- Conservation Cover 39.6 acres
- Conservation Crop Rotation 20,052.6 acres
- Residue and Tillage Management (no-till/strip till/direct seed) 1,827 acres
- Cover Crop 13,252.8 acres
- Atmospheric Resource Quality Management 47.1 acres

• Windbreak/Shelterbelt Establishment	22,795 feet
• Fence	24,315 feet
• Filter Strip	7.9 acres
• Irrigation Management (micro irrigation)	7.8 acres
• Irrigation (sprinkler)	845 acres
• Irrigation Water Management	2,855.8 acres
• Forage Harvest Management	95.7 acres
• Forage and Biomass Planting	104.1
• Pipeline Installation	4,413 feet
• Prescribed Burning	28.5 acres
• Pumping Plant	4 systems
• Roof Runoff Structure	7 systems
• Heavy Use Area Protection	3,237.4 acres
• Animal Trails and Walkways	11,292 feet
• Nutrient Management	11,381 acres
• Amendments for Treatment of Ag Waste	908 animal units
• Integrated Pest Management	11,669.3 acres
• Tree and Shrub Establishment	4.6 acres
• Watering Facility	22 systems
• Waste Treatment (windrowing)	12,069 sq ft/year
• Waste Recycling	214.9 acres
• Waste Transfer	3 systems
• Water Well	2 systems
• Upland Wildlife Habitat Management	43.1 acres
• Shallow Water Development and Management	6 acres
• Wetland Restoration	84.1 acres
• Forest Stand Improvement	57 acres
• Seasonal High Tunnel System for Crops	2,511 sq ft
• Irrigation Water Conveyance	4,253 feet

NRCS Future: The following NRCS Implementation and Funding commitments are established based upon the FY2011 budget. Should funding remain constant, these are considered annual allocations.

Cover Crop Traditional	3,500 acres annual	\$140,000
• Conservation Tillage	800 acres annual	\$10,400
• Continuous No-Till	200 acres	\$8,000
• Heavy Use Area Pads	40 units	\$188,000
• Livestock Waste Structures	3 systems	\$90,000
• Water Control Structures	10 systems	\$50,000
• Stream Fencing	10 acres	\$50,000
• Upland Prescribed Grazing	75 acres	\$2,000
• Poultry Waste Structures	15 systems	\$400,000
• Run-off Control Systems	3 systems	\$20,000
• Mortality Composters	8 systems	\$50,000
• Wetland Restoration	100 acres	varies

• Forest Harvesting Practices	175 acres	\$5,000
• Cropland Irrigation Management	5,000 acres	\$75,000
• Vegetative Environmental Buffers	10 systems	\$40,000
• Streamside/Tax Ditch Restoration	varies	\$1,128,400

Programs: The NRCS in Delaware administers a broad range of programs to assist landowners and communities with conserving and protecting natural resources. NRCS conservation programs are voluntary and provide technical and payment assistance for the planning and implementation of conservation systems. NRCS also administers several easement programs and grant programs aimed at collaborative conservation efforts.

9.3.8.1 Agricultural Management Assistance (AMA) Program

Agency: USDA, NRCS
Contact: Tim Garrahan
Title: Program Specialist
Address: 1221 College Park Drive, Suite 100
Dover De 19904
Phone: (301) 678-4260
Web: www.de.nrcs.usda.gov/programs/ama/AMA%202011/2011_agrl_man_Asst_Pro.html

Type of Program: Financia1 assistance (cost share) and technical assistance

Number of Technical Staff: 0.1

Number of Administrative Staff: 0.1

Program Description: The Agricultural Management Assistance (AMA) provides cost share assistance to agricultural producers to voluntarily address issues such as water management, water quality, and erosion control by incorporating conservation into their farming operations.

USDA's Natural Resources Conservation Service (NRCS) has leadership for the conservation provisions of AMA. The Agricultural Marketing Service (AMS) is responsible for an organic certification cost-share program and the Risk Management Agency (RMA) is responsible for mitigation of financial risk.

Agriculture BMPS Offered:

- Manure transport
- Agricultural Nutrient Management Applications
- Ammonia Emissions Reductions - Litter treatments
- Tree planting – Agricultural and Urban
- Conservation Tillage
- Stream Protection with Fencing
- Carbon Sequestration/Alternative Crops
- Continuous No-Till
- Precision Agriculture
- Agricultural Enhanced Nutrient Management
- Conservation Plans
- Cover Crops and Commodity Small Grain Enhancement
- Stream Protection without Fencing – Grazing Management Systems - Watering system alone
- Stream protection fencing and Prescribed Grazing – Grazing Management Systems - Exclusion plus upland grazing management
- Upland Rotational or Prescribed Grazing
- Barnyard Runoff Control/Loafing Lot Management
- Mortality Composters
- Horse Pasture Management
- Forest Harvesting Practices
- Riparian Forest Buffer
- Riparian Grass Buffer

Wetland Restoration and Creation

Compliance Rates: All practices are applied according to NRCS standards and specifications. Practice maintenance is the responsibility of the landowner. Annual status reviews and spot checks are used to monitor practice maintenance.

Chesapeake Bay Annual Budget: \$60,000

9.3.8.2 Wetland Reserve Program (WRP)

Agency: USDA, NRCS
Contact: Jayme Arthurs
Title: Program Specialist
Address: 1221 College Park Drive, Suite 100
Dover De 19904
Phone: (301) 678-4191
Web Page: www.de.nrcs.usda.gov/programs/wetreserve/wet_res_pro.html

Type of Program: Financia1 assistance (cost share) and technical assistance

Number of Technical Staff: 3.3

Number of Administrative Staff: 0.2

Program Description: The Wetlands Reserve Program (WRP) provides an opportunity for landowners to receive financial assistance to protect, restore and enhance wetlands on their property. These wetlands provide food and shelter for migratory birds and other wetland dependent species, including state and federally listed species, and species of concern. In addition to providing wildlife benefits, WRP helps to reduce flooding, improve water quality by filtering sediment and chemicals, recharge groundwater and more.

The program offers three enrollment options:

1. Permanent Easement is a conservation easement in perpetuity. USDA pays 100% of the easement value and up to 100% of the restoration costs.
2. 30-Year Easement is an easement that expires after 30 years. USDA pays up to 75% of the easement value and up to 75% of the restoration costs. For both permanent and 30-year easements, USDA pays all costs associated with recording the easement in the local land records office, including recording fees, charges for abstracts, survey and appraisal fees, and title insurance.
3. Restoration Cost-Share Agreement is an agreement to restore or enhance the wetland functions and values without placing an easement on the enrolled acres. USDA pays up to 75% of the restoration costs.

Agriculture BMPS Offered:

- Riparian Forest Buffer
- Riparian Grass Buffer
- Wetland Restoration and Creation

Compliance Rates: All practices are applied according to NRCS standards and specifications. Restoration areas are reviewed annually either on-site or remotely using ortho-imagery and any needed repairs or additional treatment is initiated as a result of the review.

Chesapeake Bay Annual Budget: \$215,000

9.3.8.3 Wildlife Habitat Incentives Program (WHIP)

Agency: USDA, NRCS
Contact: Tim Garrahan
Title: Program Specialist
Address: 1221 College Park Drive, Suite 100
Dover De 19904
Phone: (301) 678-4260
Web Page: www.de.nrcs.usda.gov/programs/whip/WHIP_2010/wildlife_hab_inc_pro.html

Type of Program: Financia1 assistance (cost share) and technical assistance

Number of Technical Staff: 0.2

Number of Administrative Staff: 0.1

Program Description: The Wildlife Habitat Incentive Program (WHIP) is a voluntary program for conservation-minded landowners who want to develop and improve wildlife habitat on agricultural land, nonindustrial private forest land, and Indian land. The Food, Conservation, and Energy Act of 2008 reauthorized WHIP as a voluntary approach to improving wildlife habitat in our Nation. The Natural Resources Conservation Service administers WHIP to provide both technical assistance and up to 75% cost-share assistance to establish and improve fish and wildlife habitat. WHIP cost-share agreements between NRCS and the participant generally last from one year after the last conservation practice is implemented but not more than 10 years from the date the agreement is signed. Priorities are:

- **Restore and manage upland grassland habitat to benefit ground-nesting birds and associated wildlife** - This priority was identified because the loss of undisturbed herbaceous cover (grasses and other non-woody plants) has resulted in declining populations of grassland nesting birds such as quail, meadowlarks, field sparrows, goldfinches, and pheasants, as well as other small animals such as rabbits. Since 1975, for example, the Delaware Breeding Bird Survey has shown a 72% decrease in bobwhite quail populations, while ring-necked pheasants have declined more than 95% in the same time period. This decline has been attributed to habitat loss through urbanization and more intensive agricultural production. Practices eligible for cost-sharing include field borders as well as whole-field plantings of grasses, legumes, and wildflowers, with management schedules that will benefit ground-nesting birds and other wildlife. Additional practices may include plantings of trees and shrubs where needed for woody cover.

- **Control of invasive species** - This priority was identified because thousands of acres of Delaware's wildlife habitat have been invaded by invasive species. These species are replacing Delaware's native plant species that provide quality wildlife habitat. One of the biggest invasive species problems in Delaware is phragmites, or common reed, covering over 20,000 acres of fresh and tidal wetland in our state. Phragmites is both fast growing and extremely hardy. It has taken over large areas of Delaware wetlands by displacing native plants that provide better wildlife food and cover. Its extensive root system holds dormant reeds in place during the winter, which causes a fire hazard.

Agriculture BMPS Offered:

- Forest Conservation

- Riparian Forest Buffer
- Riparian Grass Buffer
- Wetland Restoration and Creation

Compliance Rates: All practices are applied according to NRCS standards and specifications. Practice maintenance is the responsibility of the landowner. Annual status reviews and spot checks are used to monitor practice maintenance.

Chesapeake Bay Annual Budget: \$100,000

9.3.8.4 Environmental Quality Incentives Program (EQIP)

Agency: USDA, NRCS
Contact: Tim Garrahan
Title: Program Specialist
Address: 1221 College Park Drive, Suite 100
Dover De 19904
Phone: (301) 678-4260
Web Page: www.de.nrcs.usda.gov/programs/eqip/index.html

Type of Program: Financia1 assistance (cost share) and technical assistance

Number of Technical Staff: 3.3

Number of Administrative Staff: 0.2

Program Description: The Environmental Quality Incentives Program (EQIP) was reauthorized in the Farm Security and Rural Investment Act of 2002 (Farm Bill) to provide a voluntary conservation program for farmers and ranchers that promotes agricultural production and environmental quality as compatible national goals. EQIP offers financial and technical help to assist eligible participants install or implement structural and management practices on eligible agricultural land.

EQIP offers contracts with a minimum term that ends one year after the implementation of the last scheduled practices and a maximum term of ten years. These contracts provide incentive payments and cost-shares to implement conservation practices. Landowners and operators who are engaged in livestock or agricultural production on eligible land may participate in the EQIP program. EQIP activities are carried out according to an environmental quality incentives program plan of operations. The plan is developed in conjunction with the producer and identifies the appropriate conservation practice or practices to address the resource concerns. All EQIP conservation practices are subject to NRCS technical standards in the Field Office Technical Guide (FOTG) that are adapted to Delaware conditions.

EQIP provides payments up to 75% of the incurred costs and income foregone of certain conservation practices and activities. However certain historically underserved producers (Limited resource farmers/ranchers, beginning farmers/ranchers, socially disadvantaged producers) may be eligible for payments up to 90% of the estimated incurred costs and income foregone. Farmers and ranchers may elect to use a certified Technical Service Provider (TSP) for technical assistance needed for certain eligible activities and services. The new Farm Bill established a new payment limitation for individuals or legal entity participants who may not receive, directly or indirectly, payments that, in the aggregate, exceed \$300,000 for all program contracts entered during any six year period. Projects determined as having special environmental significance may, with approval of the NRCS Chief, have the payment limitation raised to a maximum of \$450,000.

Agriculture BMPS Offered: EQIP applications are accepted throughout the year at Delaware USDA Service Centers. The following are State Resource Priorities and Management Systems offered under the Delaware State EQIP Program:

1. Reduction of non-point source pollutants including nutrients, sediment, and pesticides in impaired watersheds consistent with TMDL's as well as the reduction of groundwater contamination.
 - Agricultural Waste Management Systems - Nutrients, Sediments

- Integrated Crop Management Systems - Nutrients, Pesticides
- Planned Grazing Management Systems - Nutrients, Sediments
- 2. Conservation of ground and surface water resources
 - Irrigation Water Management Systems - Water conservation
- 3. Reduction of emissions such as particulate matter and volatile organic compounds that contribute to air quality impairment.
 - Agricultural Waste Management Systems - Volatile organic compounds
 - Poultry House Windbreak Management Systems - Particulate matter
- 4. Reduction in soil erosion and sedimentation from erodible land.
 - Erosion Control Systems - Sediments
- 5. Promotion of at-risk species habitat recovery
 - Biodiversity Management Systems - Habitat recovery

Agriculture BMPs:

- Manure transport
- Agricultural Nutrient Management Applications
- Ammonia Emissions Reductions - Litter treatment
- Tree planting – agricultural and urban
- Conservation Tillage
- Stream protection with fencing - Exclusion alone
- Carbon sequestration/alternative crops
- Continuous No-till
- Precision Agriculture
- Agricultural Enhanced Nutrient Management
- Cover Crops and Commodity Small Grain Enhancement
- Stream Protection without Fencing –Watering system alone
- Stream Protection Fencing Prescribed Grazing –Exclusion plus upland grazing management
- Upland Rotational or Prescribed Grazing
- Barnyard Runoff Control/Loafing Lot Management
- Mortality Composters
- Horse Pasture Management
- Forest Harvesting Practices
- Riparian Forest Buffer
- Riparian Grass Buffer
- Wetland Restoration and Creation

Compliance Rates: All practices are applied according to NRCS standards and specifications. Practice maintenance is the responsibility of the landowner. Annual status reviews and spot checks are used to monitor practice maintenance.

Chesapeake Bay Annual Budget: \$1,787,055

Gap Analysis: There is no current plan to increase capacity because funding is to expire in 2012. The workload will be handled by existing staff, which includes a new planner in Sussex County.

9.3.8.5 Chesapeake Bay Watershed Initiative (CBWI)

Agency: USDA, NRCS
Contact: Tim Garrahan
Title: Program Specialist
Address: 1221 College Park Drive, Suite 100
Dover De 19904
Phone: (301) 678-4260
Web: www.de.nrcs.usda.gov/programs/CBWI/chesapeake_bay_watershed_initiative.html

Type of Program: Financial assistance (cost share) and technical assistance

Number of Technical Staff: 2

Number of Administrative Staff: 0.1

Program Description: The 2008 Farm Bill will provide \$188 million through the Chesapeake Bay Watershed Initiative (CBWI) over the next four years to support restoration of the Chesapeake Bay and its watershed, which represents one of the largest single federal investments in the clean-up effort and an unprecedented targeting of Farm Bill resources to a specific watershed. Congressionally authorized future funding levels are \$43 million in 2010, \$72 million in 2011 and \$50 million in 2012.

Supported agricultural conservation practices such as nutrient management, cover crops, crop residue management and vegetative buffers will improve water quality, preserve and enhance natural resources, and reduce the pollutants flowing into the streams and rivers that feed the Chesapeake Bay.

Under the CBWI, eligible landowners can use available technical and financial assistance to address excess nutrients in streams and waterways, as well as other related natural resource concerns. CBWI cost share funds are available to all landowners in the Delaware portion of the Chesapeake Bay watershed. The program is run exactly like the regular EQIP program. The only difference is that caps on units and acreage are removed on select practices and producers can apply for unlimited units.

Agriculture BMPS Offered:

- Manure transport
- Agricultural Nutrient Management Applications
- Ammonia Emission Reductions - Litter treatment
- Tree planting – agricultural and urban
- Conservation Tillage
- Stream protection with fencing
- Carbon sequestration/alternative crops
- Continuous No-till
- Precision Agriculture
- Agricultural Enhanced Nutrient Management
- Cover Crops and Commodity Small Grain Enhancement
- Stream Protection without Fencing
- Stream Protection Fencing Prescribed Grazing – Exclusion plus upland grazing management
- Upland Rotational or Prescribed grazing – no exclusion, just upland grazing management

- Barnyard Runoff Control/Loafing Lot Management
- Mortality Composters
- Horse Pasture Management
- Forest Harvesting Practices
- Riparian Forest Buffer
- Riparian Grass Buffer
- Wetland Restoration and Creation

Compliance Rates: All practices are applied according to NRCS standards and specifications. Practice maintenance is the responsibility of the landowner. Annual status reviews and spot checks are used to monitor practice maintenance.

Chesapeake Bay Annual Budget: \$1,020,093

Gap Analysis: In the last funding cycle, 123 applications went unfunded. If all were funded (using \$31,550 as the average cost of funded contract), the total cost of these additional projects would have been \$3,880,665. Only \$1,020,093 was available, therefore, funding could be quadrupled. Long term funding is not guaranteed, making it difficult to add fulltime staff beyond the two years remaining on the funding cycle. NRCS has contribution agreements with conservation districts, allowing for more capacity to deal with workload issues. The 2011 increase and subsequent decrease in funding in 2012 will be dealt with by existing staff and district staff.

9.3.9 Conservation Reserve Program (CRP)

Agency: USDA—Delaware Farm Service Agency
Contact: Lynn Manges
Title: Program Specialist
Address: 1221 College Park Dr. Suite 201
Dover, DE 19904
Phones: 302-678-4253

Type of Program: Funding, outreach, education

Technical and Administrative Staff: FSA administers CRP, while technical support functions are provided by USDA's Natural Resources Conservation Service, USDA's Cooperative Extension Service, State forestry agencies, local soil and water conservation districts and other non-Federal providers of technical assistance. FSA has a state program specialist, and each county has staff that administers CRP.

Program Description: The Conservation Reserve Program is a voluntary program available to agricultural producers to help them safeguard environmentally sensitive land. Producers enrolled in CRP plant long-term, resource-conserving covers to improve the quality of water, control soil erosion, and enhance wildlife habitat. CRP is a major contributor to increased wildlife populations. CRP also protects groundwater and helps improve the condition of lakes, rivers, ponds and streams by reducing water runoff and sedimentation.

Participants and the offered land must be certain eligibility requirements for land to be enrolled. FSA provides participants with payments on contracts with durations of 10 to 15 years. CRP payments consist of an annual rental payment that is based on the relative productivity of the soils and the average dry land cash rent, cost-share assistance of not more than 50% of the participants' costs in establishing approved practices, and other incentives where the payment amount is based on the practice. The Conservation Reserve Enhancement Program (CREP) is a part of CRP and is administered under the same statutes and Federal regulations. The primary goal of CREP is to establish a unique CRP program initiative to address specific high priority conservation and environmental objectives. Delaware's CREP was established to facilitate nutrient and sediment reduction, provide conservation buffers on Delaware's waterways and drainage systems, increase wildlife habitat, and restore natural conditions for water temperature and dissolved oxygen in areas protected by riparian forested buffers. CREP provides enhanced rental rates, enhanced cost share and enhanced incentives based on the practice. Details regarding Delaware's CREP are found in Section 9.3.10 below.

There are two signup types.

- **General Signup**---This is a designated sign-up period and is a competitive bid process during which producers may offer eligible land to be enrolled into CRP. Each offer is ranked in comparison to all other offers and selections made from that ranking. FSA uses Environmental Benefits Index factors to assess the environmental benefits for the land offered. Producers may offer land at the calculated rental rate or offer a lower rate to increase the likelihood that the offer will be accepted.
- **Continuous Signup**---Environmentally desirable land devoted to certain conservation practices may be enrolled at any time under CRP continuous sign-up. Offers are not subject to competitive bidding. *All CREP practices are continuous signup.*

Annual Budget: The annual budget for CRP is controlled at the federal level.

Chesapeake Bay Accomplishments: *There are currently 3,708 acres of CRP enrolled in the Chesapeake Bay watershed.*

Future: CRP and CREP Fact Sheets and the Delaware CREP brochure will continue to be updated and made available to all interested parties. As acres expire, producers will be offered the chance to reenroll. Due to the increased payment rate for acreage enrolled in CREP, every effort is made to encourage producers to take advantage of that program if possible. It is anticipated that CRP will be continued in the next Farm Bill.

Gap Analysis: It is anticipated that there will be a general signup in the late fall 2011 or early spring of 2012. Land rents have increased substantially in Delaware, making the rental rate offered for CRP not as competitive as in the past. Currently, due to the increased payment rate for acreage enrolled in CREP, every effort is made to encourage producers to take advantage of that program if possible (refer to above).

9.3.10 Delaware Conservation Reserve Enhancement Program (CREP)

Agency: Delaware Department of Natural Resources and Environmental Control
Contact: Dale Churchey
Title: CREP Program Coordinator
Address: 89 Kings Highway
Dover, Delaware 19901
Phone: 302-242-9943

Type of Program: Funding, Technical Services, Outreach/Education

Number of Technical Staff: 1

Number of Administrative Staff: 0

Program Description: The Delaware Conservation Reserve Enhancement Program (CREP) is a State-Federal partnership that provides financial incentives to landowners willing to voluntarily implement conservation measures on marginal agricultural land rather than continue the land in agricultural production. The resulting stream buffers and restored wetlands reduce nutrient and sediment runoff, provide increased wildlife habitat, and help protect Delaware's valuable waterbodies.

The program is voluntary and incentive-based and pays farmers and landowners for putting their least productive lands under a 10 or 15 year contract that requires the land to be put into the conservation practice the landowner chooses. Landowners can establish forest, native warm-season grasses, or cool season grasses. In return the landowner receives cost-share, annual rental payments, and generous bonus payments.

One of the major requirements to determine eligibility for enrollment in the Delaware CREP Program is the selected agricultural land must be adjacent to ditches, streams or channels that ultimately lead to waterbodies identified as impaired. All of Delaware's waterbodies are identified as impaired per Section 303(d) of the Clean Water Act due to excessive nutrient and bacteria, low dissolved oxygen, degradation of biology and habitat.

Agriculture BMPS Offered: The Delaware CREP Program had an initial goal to remove environmentally sensitive or marginal agricultural land from production and enroll the acreage in eligible conservation oriented BMPs, as defined under the Conservation Reserve Program, includes the following:

- CP21 - Grassed Filter Strips
- CP22 - Riparian Buffers
- CP23 - Wetlands Restoration Floodplain
- CP3A - Hardwood Tree Planting
- CP4D - Permanent Wildlife Habitat
- CP9 - Shallow Water Areas for Wildlife
- CP23A - Wetlands Restoration, Non-Floodplain

Delaware initially set a goal of establishing 6,000 acres of selected practices to meet the goals of the CREP Program. To date over 6,000 acres have been installed under contracts of 10 and 15 year terms.

Currently the USDA Farm Service Agency (FSA) pays 50% of installation costs for CREP practices and the State of Delaware pays 37.5% of the costs. On practices CP21, CP9 and CP4D FSA pays 64% of

the incentive payments and Delaware pays 36%. On practices CP22, CP23, CP23A and CP3A FSA pays 73% and Delaware pays 27%.

Compliance Rates: Recently, the Delaware CREP Program has increased the monitoring component of the program. As such, 10 to 20% of the active contracts are reviewed annually. Inspections are conducted in response to received complaints or through recommendations from the FSA field offices. When a landowner is found to be out of compliance, the inspector begins an education process. If the landowner refuses to bring the practice into compliance, then a series of letters are sent out requiring repayment of cost-share and informing the participant that they will be ineligible to participate in the Delaware CREP Program.

Chesapeake Bay Annual Accomplishments (2010):

CP3A Acres	CP4D Acres	CP9	CP21 Acres	Total Acres	Rental Cost State	Cost Share State	Chesapeake Bay Watershed Contracts	Private Contributions
39.6	11.1	7.2	3.5	61.4	\$13,430.70	\$2,640.05	12	\$880.05

Chesapeake Bay Annual Budget:

1 FTE = \$62,000

State Cost Share Rental Rate: \$13,430.70

State Cost Share: \$2,640.05

Gap Analysis: CREP partners will continue to enhance out-reach and education efforts to reach farmland owners and operators. One new effort ongoing is working with Public Tax Ditch managers and their constituents to encourage the establishment of grassed filter strips. More grassed filter strips along the many miles of channels in cropland would reduce sediment loads, reduce maintenance costs and aid farmers in meeting their nutrient management and conservation objectives.

9.3.11 Delaware Agricultural Lands Preservation Program

House Bill No. 200 was signed into law by then Governor Michael in June of 1991, and established the Delaware Agricultural Lands Preservation Program (DALPP). Initial funding for the program was provided in 1995, and the first farmland preservation easements were purchased and settled in 1996.

The DALPP is a voluntary program that allows landowners to sell their “development rights” to the state, thus preserving the land forever for farming, forestry, and related activities. Although the program allows very limited residential use on the land, by purchasing the development rights, the state has effectively purchased any rights to develop the land for a residential subdivision or commercial/industrial use.

This program provides a number of benefits to both Delaware farmers and taxpayers. For farmers, it allows them to unlock some of the equity in their land, but continue to own it, and farm it for income. Studies have shown that many farmers reinvest the money they receive for preserving their land back into the farm operation, stimulating local agricultural support businesses. In addition, because the state owns the developments rights, if the land is sold, it is priced as farmland, not as developable land. Consequently, the program has created a “bank” of farmland that future farmers can afford to buy because they are not competing with developers, who can afford to pay much more per acre because they are going to develop it.

For taxpayers, preserving farmland supports and ensures a viable agricultural industry in Delaware. Agriculture is Delaware’s number one industry, and provides employment, revenue, and tax base in the state. In addition, agricultural land use represents a much lower cost to taxpayers because it does not require the infrastructure and services needed by residential and other land uses, such as: schools, roads, transit, utilities, etc. Keeping agricultural areas rural, and steering population growth to existing urban areas that are prepared for growth, helps keep government costs low, and minimizes the conflict between dissimilar land uses such as residential and agricultural.

And finally, preserving agricultural farmland has numerous intangible benefits. It provides open “green space” that can be enjoyed by everyone. A significant number of the parcels preserved through the program contain forestland and even wetlands. This provides wildlife habitat, and trees to help sequester carbon from the atmosphere. Open farmland helps reduce impervious surface and runoff. And agricultural soils help filter the precipitation that replenish the state’s aquifers. These aquifers not only provide drinking water, but they replenish streams and ponds through base flow. It should also be recognized that there are studies that show land conversion from agriculture to residential developments (lawns) result in a net increase in nutrient loads. These are just a few examples.

At the close of 2011, the program had permanently preserved over 105,000 acres of prime Delaware farmland. This represents more than 20% of all the available farmland in the state. The state has expended approximately \$ 190 million dollars of state, federal, and county funds to preserve these lands. However, the actual value of the preservation easements is nearly twice this amount. This represents a substantial benefit the state, because landowners are voluntarily willing to accept less money to preserve their land.

9.3.12 Delaware Forestland Preservation Program

The Delaware Forestland Preservation program was established by Senate Bill 121, which was passed by the legislature and signed into law by the Governor in 2005. The first funding for the program was authorized in 2007, and the first forestland preservation easement were settled in October 2009.

Forestry is a recognized segment of agriculture by both the federal government and the State of Delaware. Although partially and entirely forested parcels are accepted into the Agricultural Lands Preservation Program, it was recognized that this drew funding away from preserving traditional cropland. The Forestland Preservation program was created to provide an additional preservation opportunity to parcels that are entirely covered with forest.

At the end of 2011, the program received a total of \$ 1,450,000 of state and private funding, and preserved nine (9) properties encompassing 872 acres. Although it does not appear that the state's budget will allow any funding in 2012, the program continues to receive and accept applications from landowners.

9.3.13 Delaware Young Farmer's Program

The Delaware Young Farmers Program was created by Senate Bill 117, which was passed by the Legislature and signed into law by the Governor in 2011.

The program was established to help young farmers with limited financial resources purchase farmland and begin their career as an independent farmer. The program allows the Agricultural Lands Preservation Program to provide no interest loans to qualified young farmers to purchase farmland. While the program can provide a substantial portion of the purchase price of the farmland, it cannot loan 100% of the purchase price. The participant must secure a commercial loan, gift, or other monies for a portion of the purchase price. The participant may satisfy any "interest accruing" loan(s) first, then start payment of the Young Farmer loan. However, the Young Farmer loan must be paid in full within 30 years. All loan payments are recycled back into the program to help other young farmers, and in that regard the program is self-perpetuating.

In addition to helping new generations of farmer get started in Delaware, the state benefits because any farmland it provides a loan for has a permanent preservation easement placed on it as a condition of the loan. This adds to the land being preserved by the Agricultural and Forestland Preservation Programs, and has the benefits already discussed above.

Three million dollars (\$ 3M) of initial funding was provided to the program in 2011. These funds will be distributed on a quarterly calendar basis, based on demand and available funding. The first loans are scheduled to be granted in early 2012.

9.4 Accounting for Growth

Growth will be accounted for and discussed under Section 8 – Land Use. It should be noted that many studies show land conversions from agriculture to development result in increases in nutrient loads. To that end, please note that Delaware maintains a very successful state operated farmland preservation program. Currently, approximately 100,000 acres of Delaware prime farmland is permanently preserved through the States easement program at a cost of \$174,739,304. (Nearly one fifth of Delaware's farmland is now permanently preserved.) Including the land owner discount for those easements, they are valued at \$378,342,577. This represents a significant commitment on the part of Delaware citizens to the agricultural economy in the First State. Delawareans understand the importance of viable farmland as an economic driver, wildlife habitat, and scenic vistas. The Delaware Department of Agriculture (DDA) does not expect the number of poultry operations in the Chesapeake to increase between now and 2025 and they may actually decrease.

9.5 General Gap Analysis

Need to do outreach to Amish communities in Delaware's portion of the Chesapeake Bay Watershed because there is currently no record of BMPs on these lands. Interactions with Amish farmers in other parts of the state have revealed that they often do indeed implement nutrient and sediment reducing practices and these practices should receive credit.

9.6 Strategy to Fill Gaps

Delaware's strategy to fill gaps within the Agriculture Sector will focus on three distinct and separate BMP practice categories. The first of these will focus on BMP implementation on Private Lands. Responsibilities include: financing, implementing, and maintaining best management practices to address site specific nutrient and sediment issues on their property and lands they own or lease. The second priority for BMP implementation will be on Public Lands owned or managed by State Government Agencies. Responsibilities include: provide staff, technical resources and funding to Soil Conservation Districts for technical assistance to farmers and landowners for the implementation of best management practices. The last focus will be on new and emerging BMPs. These are practices that are new in the BMP suite and there is a potential they may achieve greater nutrient or sediment reductions at lower cost, more quickly, and/or more verifiably. The Bay model does not, at this time, have the capability to accurately represent all of these approaches. As such, Delaware is committed to working closely with the Chesapeake Bay Program to assure the BMPs recommended herein will be adequately reflected within the Chesapeake Bay Model.

The BMPs that currently receive credit in the EPA Chesapeake Bay Program watershed model are described in several documents available on this website:

http://www.chesapeakebay.net/about/programs/watershed_implementation_plan_tools/#2. In 2009, the University of Maryland Mid-Atlantic Water Program produced a report ([Developing Best Management Practice Definitions and Effectiveness Estimates For Nitrogen, Phosphorus and Sediment in the Chesapeake Bay Watershed](#)) defining BMPs and establishing effectiveness estimates for numerous practices. BMPs are further defined along with other modeling assumptions in the 2010 [scenario builder documentation](#) (Estimates of County-Level Nitrogen and Phosphorus Data for Use in Modeling Pollutant Reduction). Finally, in February 2011, EPA developed a [table](#) summarizing the non-point source BMPs and efficiencies currently used in Scenario Builder which helps to summarize which practices are the most effective – this table is now included with the WIP as Appendix J.

For each of the recommendations that follow, a specific goal will be recommended for the time periods of 2011, 2013, 2017, and 2025. Where applicable, potential Funding Mechanism recommendations are made detailing the programmatic interests of parties that may have some responsibility or availability for future increased funding. See Appendix G for a table of this information.

Realizing a significant boost in funding will be warranted for full implementation, it is imperative Delaware pursue increased funding through State programs such as the State of Delaware Conservation Cost Share Program, Delaware CREP Program, Delaware Nutrient Relocation, Delaware CAFO, and Delaware Nutrient Management Programs. Likewise, it is essential Federal Programs, such as EQIP and the Chesapeake Bay Program Grant, be expanded or re-prioritized within the Chesapeake Bay Watershed to account for additional funding needs. Through the Delaware Conservation Partnership, responsible agencies meet quarterly to discuss issues or targeted or prioritized efforts, needs and funding. The Partnership is made up of representatives from NRCS, DDA, DNREC, US Fish and Wildlife, the Conservation Districts, Nutrient Planning Companies, and others. Through the Conservation Partnership, additional resources will be pursued to accommodate the increased goal of BMP implementation within the Chesapeake Watershed as highlighted within this document.

As additional funding needs will certainly be warranted, private grants and/or exploratory grants will be additionally pursued. Lastly, to accommodate easier land owner participation by Private Landowners, the State of Delaware Revolving Loan Fund Program should be reviewed and expanded to allow additional BMP funding as applicable.

9.6.1 Best Management Practices for Private Lands

9.6.1.1 Cover Crops – Traditional: Cover crops are small grains such as wheat, rye, or barley that are planted in the fall after the harvest of corn, soybeans, and/or other summer crops to absorb residual fertilizer that may remain in the soil. Cover crops reduce erosion and the leaching of nutrients to groundwater by maintaining a vegetative cover on cropland and holding nutrients within the root zone. This practice involves the planting and growing of cereal crops (non-harvested) with minimal disturbance of the surface soil. The crop is seeded directly into vegetative cover or crop residue with little disturbance of the surface soil. These crops capture or “trap” nitrogen in their tissues as they grow. By timing the cover crop burn or plow-down in spring, the trapped nitrogen can be released and used by the following crop. Different species are accepted as well as, different times of planting (early, late and standard), and fertilizer application restrictions.

They are a popular BMP in Delaware, although their implementation rates can be increased. Due to weather and cropping patterns, area agriculture representatives feel that the most realistic goal for cover crops in any given year is 50% of the crop land. To accomplish this goal, several strategies should be adopted:

1. Obtain additional funding for cover crop incentive payments. Incentive rates need to be raised to cover the farmers' costs plus provide enough of an incentive to entice the farmer to plant the cover crop. Some fields are small with wet soils and the farmers don't want the hassle with these field conditions. This is more the case in the Inland Bays, but it can happen in the Chesapeake too.
2. Obtain extra funds to increase the caps so more farmers will plant more acreage. Now some farmers only plant enough to reach the cap.

3. Continue to allow harvesting of the crops - turning a cover crop into a commodity cover crop. Harvesting removes the nitrogen from the fields as well as stretches the cost-share money since only partial payments are made to those harvesting cover crops. The current programs that allow harvesting do not allow fertilization until after March 1st.
4. Modify cost-share programs to further incentive early plantings of the most efficient species.
5. FSA is working on creating a code for farmers to report cover crops to help with tracking voluntary acreage. Delaware would appreciate assistance from EPA to ensure that the information on design, implementation, and maintenance collected is sufficient to allow proper crediting in the model.
6. Utilize a targeted approach and develop different recommendations for different watersheds.

In 2010, 16,600 acres of traditional cover crops were planted. Delaware's goal is to expand this acreage by 3,320 acres to 19,920 acres for 2011. To meet this requirement, funding in the range of \$35 - \$50 per acre, or \$116,200 - \$166,000 is needed annually. By 2025, Delaware's goal is to expand this practice to 66,400 acres. Based upon current cost share rates, the projected cost for full implementation will be \$2,324,000 to \$3,320,000 annually. However, as competing factors (e.g. high market commodity prices) greatly influence landowner decision to participate in cost share programs, this cost is considered conservative.

In 2012, Cost Share signups for Sussex County resulted in 105 applications received the SCD to plant 70,779 acres of cover crop within the Chesapeake Bay watershed. At a conservative estimate of \$30 per acre, full implementation for all applicants considered is \$2,123,970. As funding is currently limited, approximately 15,200 acres (traditional and commodity combined) were funded in 2012 at a cost of \$429,625. This shortfall is limited to funding as adequate numbers of applications are received annually. Similarly, Kent County experiences comparative shortfalls. However, as sign-ups are continuous in Kent County rather than date specific, details of a shortfall are more difficult to calculate.

- **2011 Goal:** 19,920 acres.
- **2013 Goal:** 26,560 acres.
- **2017 Goal:** 46,480 acres.
- **2025 Goal:** 66,400 acres.

FUNDING MECHANISM: Cost share funding to offset the costs of implementation to the landowners is available from the State of Delaware Conservation Cost Share Program and the various Farm Bill programs. Additional funding is provided through the Chesapeake Bay Grant and the CWA Section 319 Program. Additional sources will be pursued to allow for the increased BMP implementation schedule. For example, additional funding requests will be made through the State of Delaware Legislative Budget development process to increase contributions to the State of Delaware Conservation Cost Share Program.

In light of funding constraints, other strategies to facilitate increased plantings of cover crops are also being explored. During the Fall of 2012, pending the availability of funds, the Sussex Conservation District will initiate the Rye Seed Pilot Project in the Chesapeake Watershed. The purpose of this pilot project is to get additional acres of rye planted in the Chesapeake Bay Watershed in order to meet the goals of the WIP and TMDLs, and determine what incentive it takes to get farmers in the watershed to plant rye no later than October 1, 2012. The Sussex Conservation District is going to pre-order rye seed to be delivered to the conservation district and distributed to farmers in a select subwatershed of the Chesapeake Bay. One of the biggest excuses from farmers as to why they can't plant rye is because of its unavailability. The seed will

be given to farmers signed up to plant rye for early planting, and will be distributed to those farmers on a first come, first served basis, with the stipulation that they must plant the seed early and it cannot be harvested. All other program requirements apply. Most likely, caps or limits to the amount of seed any one farmer can receive will be in place, and will be determined based on interest of the program. Initially, \$50,000 of rye seed will be purchased with an August scheduled delivery for distribution.

9.6.1.2 Cover Crops – Commodity: Commodity cover crops are small grains such as wheat, rye, or barley that are planted in the fall after the harvest of corn, soybeans, and/or other summer crops to absorb residual fertilizer that may remain in the soil. Cover crops provide a ground cover that prevents winter soil erosion.

Commodity cover crops differ from cereal cover crops in that they may be harvested for grain, hay or silage and they may receive nutrient applications, but only after March 1 of the spring following their establishment. The intent of the practice is to modify normal small grain production practices by eliminating fall and winter fertilization so that crops function similarly to cover crops by scavenging available soil nitrogen for part of their production cycle.

Historically, this data has not been reported in Delaware in the past. Several cost share programs allow harvesting of cover crops after March 15th, with fertilizer or manure applications allowed after March 1st. However, based upon a consensus of participating partner agencies, the estimate of 6,595 acres annually is provided as a conservative estimate.

In 2010, 6,595 acres of commodity cover crops were planted. Delaware's goal is to expand this acreage by 1,218 acres to 7,813 acres for 2011. To meet this requirement, funding in the range of \$15 - \$30 per acre, or \$18,279 to \$36,540 is needed annually. By 2025, Delaware's goal is to expand this practice to 26,365 acres annually. Based upon current cost share rates, the projected cost for full implementation will be \$395,475 - \$790,950 annually. However, as competing factors (e.g. high market commodity prices) greatly influence landowner decision to participate in cost share programs, this cost is considered conservative.

In 2012, Cost Share signups for Sussex County resulted in 105 applications received the SCD to plant 70,779 acres of cover crop within the Chesapeake Bay watershed. At a conservative estimate of \$30 per acre, full implementation for all applicants considered would be \$2,123,970. As funding is currently limited, approximately 33,000 acres (traditional and commodity combined) were funded in 2012. This short fall is limited to funding as adequate numbers of applications are received annually. Similarly, Kent County experiences comparative shortfalls. However, as sign-ups are continuous in Kent County rather than date specific, details of a shortfall are more difficult to calculate.

- **2011 Goal:** 7,813 acres.
- **2013 Goal:** 10,249 acres.
- **2017 Goal:** 18,157 acres.
- **2025 Goal:** 26,365 acres.

FUNDING MECHANISM: Cost share funding to offset the costs of implementation to the landowners is available from the State of Delaware Conservation Cost Share Program and the various Farm Bill programs. Additional funding is provided through the Chesapeake Bay Grant and the CWA Section 319 Program. Additional sources will be pursued to allow for the increased BMP implementation schedule. For

example, additional funding requests will be made through the State of Delaware Legislative Budget development process to increase contributions to the State of Delaware Conservation Cost Share Program.

9.6.1.3 Nutrient Management Compliance: Land owners must submit Nutrient Management Plans to demonstrate that they efficiently use manure or fertilizer to grow healthy crops, and significantly minimize the application of excessive nutrients that could be lost to the environment. The State of Delaware Nutrient Management Commission conducts Nutrient Management Compliance Desk Audits on all submitted Nutrient Management Annual Reports representing the entire 216,290 acres annually.

GOAL: There are currently 216,290 acres of land under Nutrient Management Compliance; Delaware's goal is to maintain this amount for through 2025. We do not know the amount of additional funding needed in order to maintain our current Compliance.

FUNDING MECHANISM: Regulatory requirement. Plan development reimbursement funding is provided programmatically through the Delaware Nutrient Management Commission.

9.6.1.4 Soil Conservation and Water Quality Plans: These plans will address natural resource management on agricultural lands and recommend best management practices that control sediment loss resulting from erosion, and control nutrient runoff.

GOAL: There are currently 194,666 acres of land under Soil Conservation and Water Quality Plans. Delaware's goal is to maintain this amount through 2025.

FUNDING MECHANISM: Cost share funding to offset the costs of implementation to the landowners is available from the State of Delaware Conservation Cost Share Program and the various Farm Bill programs. Additional funding is provided through the Chesapeake Bay Grant and the CWA Section 319 Program. Additional sources will be pursued to allow for the increased BMP implementation schedule. For example, additional funding requests will be made through the State of Delaware Legislative Budget development process to increase contributions to the State of Delaware Conservation Cost Share Program.

9.6.1.5 Conservation Tillage: Conservation tillage involves planting and growing crops with minimal disturbance of the surface soil. No-till farming, a form of conservation tillage, is used to seed the crop directly into vegetative cover crop residue with no disturbance to the soil surface. Minimal tillage farming involves some disturbance of the soil, but uses tillage equipment that leaves much of the vegetative cover or crop residue on the surface.

Delaware has reported acres of conservation tillage where the residue is 15% or greater based on USDA NRCS data at a county scale. This most likely does not represent all agricultural producers, just the total for those who participate in USDA programs. There is room for better reporting and possibly increased implementation.

There are currently 197,779 acres of conservation tillage. Delaware's goal is to expand this by 6,000 additional acres annually. The cost of implementing this practice is \$13/acre. By 2025, Delaware intends to have full implementation on 227,000 acres within the Chesapeake Bay Watershed. The cost of full implementation for this practice, estimated using current costs, is \$3,279,770.

2011 Goal: 203,779 acres annual.

2013 Goal: 215,799 acres annual.
2017 Goal: 219,519 acres annual.
2025 Goal: 227,000 acres annual.

FUNDING MECHANISM: Cost share funding to offset the costs could be available from the State of Delaware Conservation Cost Share Program and the various Farm Bill programs.

9.6.1.6 Continuous No-Tillage Conservation: For Continuous No-Till, the seed is applied into a vegetative cover or crop residue with no disturbance to the surface soil. Conservation tillage involves planting and growing crops with minimal disturbance of the surface soil. No-till farming, a form of conservation tillage, is used to seed the crop directly into vegetative cover crop residue with no disturbance to the soil surface. Minimal tillage farming involves some disturbance of the soil, but uses tillage equipment that leaves much of the vegetative cover or crop residue on the surface.

The NRCS has a practice called long term no-till which they consider a carbon sequestration practice. EPA modelers have indicated that this would instead fall under continuous no-till. Approximately 3,527 acres of this practice has been implemented since 2005 and the NRCS has set a goal of an additional 1,000 acres per year between now and 2025.

There are currently 23,159 acres of Continuous No-Till Conservation; Delaware's goal is to expand this by 1,000 acres annually. By 2011, Delaware hopes to have 24, 159 acres of land within the continuous no-till conservation practice. Additional funding of \$40/acre is needed. By 2025, Continuous No-Till Conservation will cover over 36,159 acres, bringing the cost of full implementation to \$1,446,360.

2011 Goal: 24,159 acres.
2013 Goal: 26,159 acres
2017 Goal: 32,159 acres
2025 Goal: 36,159 acres.

FUNDING MECHANISM: Cost share funding to offset the costs could be available from the State of Delaware Conservation Cost Share Program and the various Farm Bill programs.

9.6.1.7 Decision Agriculture: Decision agriculture seeks to maximize the efficiency of nutrient application to cropland in order to minimize waste and nutrient runoff. The practice encompasses a management system that is information and technology based, is site specific and uses one or more of the following sources of data: soils, crops, nutrients, pests, moisture, or yield for optimum profitability, sustainability, and protection of the environment.

There are currently 103,186 acres of land following Decision Agriculture protocols; Delaware's goal is to expand this by 20,637 acres annually. The cost to fund this practice is \$30/acre. By 2025, Delaware intends to achieve full implementation on 227,008 acres at a cost of \$6,810,240.

- **2011 Goal:** 123,823 acres.
- **2013 Goal:** 165,097 acres.
- **2017 Goal:** 185,097 acres.
- **2025 Goal:** 227,000 acres.

FUNDING MECHANISM: Cost share funding to offset the costs could be available from the State of Delaware Conservation Cost Share Program and the various Farm Bill programs.

9.6.1.8 Heavy Use Poultry Area Pads: Establishing a pad structure stabilizes areas frequently and intensively used by people, animal, or equipment to prevent nutrient movement into surface and groundwater.

There are currently 227 structures of Heavy Use Poultry Area Pads; Delaware's goal is to expand this by 45 additional structures annually. Additional funding of \$4,661/unit is needed. By 2025, there will be 857 Pads, requiring an additional funding amount of \$2,936,430 to achieve full implementation.

- **2011 Goal:** 272 structures.
- **2013 Goal:** 362 structures.
- **2017 Goal:** 632 structures.
- **2025 Goal:** 857 structures.

FUNDING MECHANISM: Cost share funding to offset the costs if implementation to the landowners is available from the State of Delaware Conservation Cost Share Program and the various Farm Bill programs. Additional funding is provided through the Chesapeake Bay Grant and the CWA Section 319 Program. Additional sources will be pursued to allow for the increased BMP implementation schedule. For example, additional funding requests will be made through the State of Delaware Legislative Budget development process to increase contributions to the State of Delaware Conservation Cost Share Program.

9.6.1.9 Livestock Waste Structures: Animal waste is stored in structures to protect it from the weather until it can be used as a crop fertilizer when conditions are appropriate for transport to another location.

There are currently 3 swine, 7 equine, 4 dairy, 10 dairy waste, and 3 bovine structures; Delaware's goal is to expand this to 4 swine, 10 equine, 5 dairy, 12 dairy waste, and 4 bovine structures for 2010-2011. Funding of \$25,000 for the swine structure, \$15,000 for the equine structure, \$60,000 for the dairy structure, and \$50,000 for the bovine structure is needed to meet the 2011 goal. By 2025, Delaware intends to maintain full implementation at a cost of \$250,000 for swine, \$420,000 for equine, \$1,440,000 for dairy, and \$200,000 for bovine.

- **2011 Goal:** 4 swine, 10 equine, 5 dairy, 12 dairy waste, and 4 bovine
- **2013 Goal:** 6 Swine, 16 Equine, 10 Dairy, 16 Dairy Waste, 6 bovine
- **2017 Goal:** Achieve Full capacity. 10 Swine, 28 Equine, 11 Dairy, 16 Dairy Waste, 10 Bovine
- **2025 Goal:** Maintain full implementation.

FUNDING MECHANISM: Cost share funding to offset the costs if implementation to the landowners is available from the State of Delaware Conservation Cost Share Program and the various Farm Bill programs. Additionally, funds are often available to landowners through the Delaware State Revolving Loan Fund.

Additional sources will be pursued via the Chesapeake Bay Grant and the CWA Section 319 Program. Funding requests will be made through the State of Delaware Legislative Budget development process to increase contributions to the State of Delaware Conservation Cost Share Program.

9.6.1.10 Water Control Structures: These structures are used in constructed drainage systems to control water depth and flow rates. They also increase water retention and decrease the quantity and quality of pollutants downstream.

Delaware has long supported the practice of water control structures, however a comprehensive database on the existing structures does not currently exist. Through working with local contacts in DNREC's Drainage Program, the NRCS, and County Conservation Districts, DNREC IT staff have started a database for tracking purposes. The location of each structure, the date it was installed, and the date the structure was removed, if applicable, will be available fields. Then, using a program called StreamStat, the area draining to each structure will be calculated and compared to paper records if they exist. Additionally, the land use composition of the drainage area will be determined using the most recent Delaware land use and land cover data set. Finally, we will determine if any of the existing structures exist on state owned lands and identify potential opportunities for installing new structures on state lands first.

There are currently 50 units for 8,343 acres; Delaware's goal is to increase to 51 units for 2011. Additional funding of \$5,000 per unit is needed. By 2025, there will be 65 total structures covering 10,846 acres, requiring \$75,000 to achieve full implementation.

- **2011 Goal:** 51 units.
- **2013 Goal:** 53 units to cover 8,841 acres.
- **2017 Goal:** 57 units to cover 9,505 acres.
- **2025 Goal:** 65 total structures covering 10,846 acres.

FUNDING MECHANISM: Cost share funding to offset the costs if implementation to the landowners is available from the State of Delaware Conservation Cost Share Program and the various Farm Bill programs. Additional funding is provided through the Chesapeake Bay Grant and the CWA Section 319 Program. New sources will be pursued to allow for the increased BMP implementation schedule. For example, additional funding requests will be made through the State of Delaware Legislative Budget development process to increase contributions to the State of Delaware Conservation Cost Share Program.

9.6.1.11 Stream Protection with Fencing: Pasture fencing keeps farm animals out of streams and prevents stream bank erosion.

There are currently 108 acres of Stream Protection with Fencing; Delaware's goal is to increase this to 118 acres for 2011. The cost to implement this practice is \$20 per acre or \$2/ft. By 2025, there will be 258 total acres.

- **2011 Goal:** 118 acres.
- **2013 Goal:** 138 acres.
- **2017 Goal:** 198 acres.
- **2025 Goal:** 258 total acres.

FUNDING MECHANISM: Cost share funding to offset the costs could be available from the State of Delaware Conservation Cost Share Program and the various Farm Bill programs.

9.6.1.12 Stream Protection without Fencing: Watering troughs provide a safe, reliable source of water from livestock that is away from streams. The troughs help protect stream banks from erosion that may be caused by farm animals.

There are currently no acres of Stream Protection without Fencing. Additional funding of \$700/each is needed for each installed system. By 2025, there will be 325 total acres, bringing the cost of full implementation to \$227,500.

- **2011 Goal:** 25 acres
- **2013 Goal:** 75 acres
- **2017 Goal:** 225 acres
- **2025 Goal:** 325 total acres.

FUNDING MECHANISM: Cost share funding to offset the costs could be available from the State of Delaware Conservation Cost Share Program and the various Farm Bill programs.

Upland Prescribed Grazing: This data has not been reported in Delaware in the past. NRCS maintains a data set which indicates that there are 214 acres of prescribed grazing in the Chesapeake. By 2025, Delaware intends to increase implementation to 1,134 acres.

- **2011 Goal:** 214 acres.
- **2013 Goal:** 274 acres.
- **2017 Goal:** 724 acres.
- **2025 Goal:** 1,134 acres.

FUNDING MECHANISM: Cost share funding to offset the costs could be available from the State of Delaware Conservation Cost Share Program and the various Farm Bill programs.

9.6.1.14 Manure Relocation: Excess manure is transported away from farms with high phosphorus levels to other farms or locations that can use the manure safely.

The Nutrient Relocation Program is already fully implemented. Currently, 80% of the manure that is relocated from Delaware's Chesapeake watersheds is sent out of the Chesapeake watershed or to alternative uses. Approximately 4% is relocated to other Chesapeake watersheds in the state and 16% to other Chesapeake watersheds in other states.

DDA and the DNMC are currently considering methods to increase total manure relocation, especially outside the Chesapeake Bay Watershed. The Commission is considering raising the reimbursement paid per ton/mile and adding incentives to further encourage relocation outside the watershed. In addition, the Commission is looking at ways to provide incentives to small haulers who do not have access to scales for weighting tonnage for reimbursement.

There is currently 48,757 tons of manure in the Manure Relocation Program. Delaware's goal is to increase this by an additional 4,000 tons annually for a total annual relocation of 52.757 tons by 2011. The cost to meet the 2011 goal is \$17,280 annual based on a rate of \$4.32/ton. By 2025, there will be 110,757 tons relocated annually, bringing the annual cost of full implementation to \$478,470.

- **2011 Goal:** 52.757 tons.
- **2013 Goal:** 60,757 tons.
- **2017 Goal:** 72,757 tons.
- **2025 Goal:** 110,757 tons.

DNMC's cost-share program for manure relocation will provide outreach in order to gain more participants in the relocation program. The Perdue Agri-recycle facilities will continue to take excess manure for their plant as well. This relocation goal would be achieved on an annual basis. The DNMC tracks the manure that is relocated and reports that data such that progress towards the goal may be tracked.

The relocation goals identified above will be revised once the CBP Agriculture Workgroup panel reviewing manure volume and content model input values has reached consensus on appropriate revisions.

FUNDING MECHANISM: Cost share funding to offset the costs of implementation to the landowners is available from the State of Delaware Conservation Cost Share Program and the various Farm Bill programs. Additional funding is provided through the Chesapeake Bay Grant and the CWA Section 319 Program. Additional sources will be pursued to allow for the increased BMP implementation schedule. For example, additional funding requests will be made through the State of Delaware Legislative Budget development process to increase contributions to the State of Delaware Conservation Cost Share Program.

9.6.1.15 Poultry Waste Structures: These structures protect poultry waste from rain so that it can be used as a crop fertilizer when conditions are appropriate for transport to another location.

There are currently 444 structures of Poultry Waste Structures. Delaware's goal is to increase this by 20% annually. Delaware intends to achieve full implementation of 723 structures by 2025. The cost to fully implement this practice is \$7,534,395 using a rate of \$27,005/each.

- **2011 Goal:** 532 structures.
- **2013 Goal:** 708 structures.
- **2017 Goal:** 712 structures.
- **2025 Goal:** 723 structures.

FUNDING MECHANISM: Cost share funding to offset the costs of implementation to the landowners is available from the State of Delaware Conservation Cost Share Program and the various Farm Bill programs. Additional funding is provided through the Chesapeake Bay Grant and the CWA Section 319 Program. Additional sources will be pursued to allow for the increased BMP implementation schedule. For example, additional funding requests will be made through the State of Delaware Legislative Budget development process to increase contributions to the State of Delaware Conservation Cost Share Program.

9.6.1.16 Run-Off Control Systems: Run-Off Control Systems use a variety of techniques to direct rainwater to places where it will not cause nutrient runoff or soil erosion. Gutters and downspouts on barns and grading of the land are examples of ways to direct runoff from rainfall.

There are currently no Run-Off Control Systems; Delaware's goal is to increase this to 8 systems for 2010-2012. The cost to meet the 2011 goals is \$84,000 using a rate of \$10,500/each. By 2025, there will be an additional 10 systems installed annually for a total of 120 total systems. Annually, 10 additional systems will cost \$105,000.

- **2011 Goal:** 8 systems.
- **2013 Goal:** 24 systems.
- **2017 Goal:** 72 systems.
- **2025 Goal:** 120 total systems.

FUNDING MECHANISM: Cost share funding to offset the costs could be available from the State of Delaware Conservation Cost Share Program and the various Farm Bill programs.

9.6.1.17 Phytase Utilization: With the advent of phytase addition to the diet and feed for all poultry in Delaware, we have noticed a steady reduction in the phosphorus levels in poultry manure. Research demonstrates that a 30-40% reduction is achievable.

GOAL: As is currently realized, continue with a full utilization of Phytase within all feed components used within the Chesapeake Bay Watershed. Recent research has indicated a 33% reduction is achievable. With further research and development, higher reductions will be realized by 2025. Delaware anticipates that with the potential modifications regarding the volume and nutrient content of poultry litter currently being reviewed by an Agriculture Workgroup panel, the modeled phosphorus content of poultry litter will decrease as a result of not only diet, but also bird genetics and manure handling practices.

FUNDING MECHANISM: None

9.6.1.18 Mortality Composters: Recommend dead bird composters/incinerators on all poultry operations for bird mortality. Dead bird composters have been cost shared and promoted in Delaware, however, there is likely room to increase this implementation rate.

Increase implementation of Mortality Composters: for small operations (AFOs), at least 50% of operations in each sub-watershed should have these practices; for medium and large operations (CAFOs), 100% of operations should have these practices. There are currently 449 Mortality Composters; Delaware's goal is to increase this to 539 composters for 2011. Approximately \$595,620 is needed to meet the 2011 goal. Delaware intends to achieve full implementation (723 structures) by 2017. Currently, adequate funds exist to meet this goal.

- **2011 Goal:** 539 composters.
- **2013 Goal:** 600 structures.
- **2017 Goal:** Achieve full implementation of 723 structures.
- **2025 Goal:** Maintain full implementation.

FUNDING MECHANISM: Cost share funding to offset the costs of implementation to the landowners is available from the State of Delaware Conservation Cost Share Program and the various Farm Bill programs. Additional funding is provided through the Chesapeake Bay Grant and the CWA Section 319 Program. Additional sources will be pursued to allow for the increased BMP implementation schedule. For example, additional funding requests will be made through the State of Delaware Legislative Budget development process to increase contributions to the State of Delaware Conservation Cost Share Program.

9.6.1.19 Large Animal Mortality Program: Offer large animal mortality handling for operations with large animals. Program will assure off-site transport for large animal mortality.

Goal: There are currently 110 animals annually. Current cost is \$175 to \$250 per animal depending on distance of transportation. Delaware's goal is to maintain this rate of implementation annually based upon demand. Continued funding of approximately \$60,000 annually is needed to continue this practice. Funds currently exist for this practice. However, depending upon demand, the budget is rapidly diminishing. Additional funds will be pursued through the State of Delaware budget proposal process.

FUNDING MECHANISM: Cost share funding to offset the costs of implementation to the landowners is available from the State of Delaware Conservation Cost Share Program. Additional sources will be pursued to allow for the increased BMP implementation schedule. For example, additional funding requests will be made through the State of Delaware Legislative Budget development process to increase contributions to the State of Delaware Conservation Cost Share Program.

9.6.1.20 Streamside Grass Buffers: Grasses planted next to waterways filter and take up nutrients from run-off, stabilize the soil, and provide wildlife habitat.

There are currently 699 acres; Delaware's goal is to increase by 69 acres to 768 acres for 2010-2011 on private lands. The cost of implementation is \$300/acre, with an additional \$65/acre/year land rental and \$35.17/acre/year interest. By 2025, Delaware's goal is to increase the streamside grass buffer acreage to 1,734 acres. Funds currently exist of full CRP and CREP grass buffer installation. Full implementation of this practice is limited to participants rather than funds. Further education and outreach opportunities will be pursued.

- **2011 Goal:** 768 acres.
- **2013 Goal:** 906 acres.
- **2017 Goal:** 1,321 acres.
- **2025 Goal:** 1,734 acres.

FUNDING MECHANISM: Cost share funding to offset the costs of implementation are available for the implementation of grass buffers on private agricultural lands through the Delaware Conservation Reserve Enhancement Program and USDA's Conservation Reserve Enhancement Program.

9.6.1.21 Streamside Forest Buffers: Trees planted next to waterways filter and take up nutrients from run-off, stabilize the soil, and provide wildlife habitat.

There are currently 2,226 acres of Streamside Forest Buffers; Delaware's goal is to increase by 223 acres to 2,449 acres for 2011 on private lands. The cost of implementation is \$425/acre average for installation

with an additional \$138/acre/year land rental, \$35.60/acre/year interest, and \$5 acre/year maintenance. By 2025, Delaware's goal is to increase the streamside forest buffer acreage to 5,571 acres. Funds currently exist for full CRP and CREP grass buffer installation. Full implementation of this practice is limited to participants rather than funds. Further education and outreach opportunities will be pursued.

- **2011 Goal:** 2,449 acres.
- **2013 Goal:** 2,895 acres.
- **2017 Goal:** 4,234 acres.
- **2025 Goal:** 5,571 acres.

FUNDING MECHANISM: Cost share funding to offset the costs of implementation are available for the implementation of grass buffers on private agricultural lands through the Delaware Conservation Reserve Enhancement Program and USDA's Conservation Reserve Enhancement Program.

9.6.1.22 Wetland Restoration: A wetland is an area of land where the soil is wet or covered with water. Wetlands can be in the form of bogs, swamps, or marshes.

There are currently 286 acres of Wetland Restoration; Delaware's goal is to increase by 29 acres to 315 acres for 2010-2011 on private lands. The cost of implementation is \$1,072/acre average for installation, with an additional \$138/acre/year land rental and \$5 acre/year maintenance. By 2025, Delaware's goal is to increase the wetland restoration acreage to 721 acres. Funds currently exist for full CRP and CREP wetland restoration installation. Additional funds currently exist for non CRP/CREP style installations. Full implementation of this practice is limited to participants rather than funds. Further education and outreach opportunities will be pursued.

- **2011 Goal:** 315 acres.
- **2013 Goal:** 373 acres.
- **2017 Goal:** 548 acres.
- **2025 Goal:** 721 acres.

FUNDING MECHANISM: Cost share funding to offset the costs of implementation are available for the implementation of Wetland Restoration on private agricultural lands through the Delaware Conservation Reserve Enhancement Program and USDA's Conservation Reserve Enhancement Program. Funding for wetland creation, restoration, and enhancement is also available from various federal sources, State and local government and nonprofit organizations.

9.6.1.23 Shoreline Erosion Control: Shore stabilization projects on private agricultural land that reduces erosion and stabilizes shorelines. Mitigation options to protect shorelines provide nutrient and sediment reductions.

To date, there 33 shoreline stabilization projects have been permitted in the Chesapeake Bay Watershed. This represents 6,343 feet of shoreline protect (4,953 feet of the protected shoreline is privately owned and 1,390 feet of the protected shoreline is publicly owned). Delaware's goal is to protect an additional 600 feet annually. By 2025, Delaware hopes to achieve a total of 15,343 feet protected shoreline.

- **2011 Goal:** 6,943 feet.

- **2013 Goal:** 8,143 feet.
- **2017 Goal:** 11,744 feet.
- **2025 Goal:** 15,343 feet.

FUNDING MECHANISM: Cost share funding to offset the costs could be available from the State of Delaware Conservation Cost Share Program and the various Farm Bill programs. Funding for shoreline stabilization is also available from various federal sources, State and local government and nonprofit organizations.

9.6.1.24 Retire Highly Erodible Land: Land that is especially vulnerable to erosion is removed from crop or hay production and planted in either grass or forest. This land is not usually disturbed for at least 10 years.

Delaware's goal is to retire 277 acres of highly erodible land for 2011. Additional funding of \$300/acre average cost is needed. By 2025, there will be an increase of 300 acres/year of Highly Erodible Land, for a total of 697 acres.

- **2011 Goal:** 277 acres.
- **2013 Goal:** 487 acres.
- **2017 Goal:** 592 acres.
- **2025 Goal:** 697 acres.

FUNDING MECHANISM: Cost share funding to offset the costs could be available from the State of Delaware Conservation Cost Share Program and the various Farm Bill programs.

9.6.1.25 Land Retirement: Land retirement influences multiple environmental concerns beyond reducing soil erosion, such as improving water quality and protecting wildlife habitat. Land retirement programs include NRCS Conservation Reserve Program and, to a lesser extent, the Wetland Reserve Program.

Goal: Maintain existing 416 acres of land retirement. Land retirement removes acreage from crop or hay production and is planted in either grass or forest. This land usually is not disturbed for at least 10 years. Cost share funds are available for the retirement of highly erodible agricultural lands through the USDAs Conservation Reserve Program or the Wetland Reserve Program.

FUNDING MECHANISM: Cost share funding to offset the costs could be available from the State of Delaware Conservation Cost Share Program and the various Farm Bill programs.

9.6.1.26 Forest Harvesting Practices: Data on forest harvesting practices is tracked by the Delaware Forest Service. The acreage reported represents the areas that underwent timber harvest, either clearcutting or selective harvest. The Delaware Forest Service is the permitting agency for any logging operations that are 1 acre or larger if the land is to remain as forest afterwards. If it is to be converted for development or agriculture, it passes to DNREC/Conservation District/COE jurisdiction. The Forest Service approves or disapproves permits as they are submitted and makes sure the BMP laws are adhered to during and after harvest through field inspections. The primary laws enforced are water quality BMPs (all harvests) and adequate regeneration of commercial tree species (only when the Seed Tree Law is

triggered by a harvest that is at least 10 acres, at least 25% pine and/or yellow-poplar, and not to be converted to a non-forest land use).

Goal: Maintain existing 2,070 acres. Clear-cut acreage since 2005 is 1,050. Averaging 31 acres per clear cutting permit (34 permits). Track forest harvesting BMPs for 210 acres annually through 2025.

FUNDING MECHANISM: Cost share funding to offset the costs could be available from the State of Delaware Conservation Cost Share Program and the various Farm Bill programs.

9.6.2 Best Management Practices for Public Lands

The following suite of BMPs represents voluntary activities recommended for Government agencies owning Public Lands.

During 2010, a Public Land survey was conducted to assess lands owned and/or managed by State Government Agencies. The following details regarding active row-crop acreage in agriculture on State owned lands:

State Owned Lands	Total Acres by Agency
DDA Forest Lands	1,560.30
DelDot Ag Lease	45.76
DNREC, Fish and Wildlife	1,490.78
DNREC, State Parks	442.18
Total Acres	3,539.02

Through this assessment, the following recommendations and resulting load reductions are provided for publicly owned properties:

Practice	TN Load (lb/year)	TN Load Reduction	TP Load (lb/year)	TP Load Reduction	TSS Load (lb/year)	TSS Load Reduction
35' Grass Buffers on 52 acres	861		87		17,582	
35' Forest Buffers on 52 acres	1,083		94		20,722	
Early Cover Crops on 3,539 acres annually	16,133		520		141,632	
Cover Crops (3,487 acres)+ Forest Buffer (52 acres)	16,728		600		158,209	
Cover Crops (3,487 acres)+ Grass Buffer (52 acres)	16,606		594		155,697	
Restore 3,539 acres to Forest	29,905		3,327		572,790	
Restore 3,539 acres to Grass	28,985		2,867		357,264	

9.6.2.1 Cover Crops: Cover crops are small grains such as wheat, rye, or barley that are planted in the fall after the harvest of corn, soybeans, and/or other summer crops to absorb residual fertilizer that may remain in the soil. Cover crops reduce erosion and the leaching of nutrients to groundwater by maintaining a

vegetative cover on cropland and holding nutrients within the root zone. This practice involves the planting and growing of cereal crops (non-harvested) with minimal disturbance of the surface soil. The crop is seeded directly into vegetative cover or crop residue with little disturbance of the surface soil. These crops capture or "trap" nitrogen in their tissues as they grow. By timing the cover crop burn or plow-down in spring, the trapped nitrogen can be released and used by the following crop. Different species are accepted as well as, different times of planting (early, late and standard), and fertilizer application restrictions.

Goal: By 2025, annually plant 3,559 of early planted cover crop on public lands. Cost will be \$70 per acre.

Funding: Cost Share funding offered to lease to offset costs of BMP implementation.

9.6.2.2 Tree Planting: Delaware does not have extensive data on public land Tree Planting previous to 2005.

Goal: The current amount of Tree Planting varies by year; Delaware's goal is to increase the amount annually. The cost of practice implementation is up to \$400/acre. By 2025, there will be 108 additional acres planted.

FUNDING MECHANISM: Property owner incurred costs.

9.6.2.3 Wetland Restoration: A wetland is an area of land where the soil is wet or covered with water. Wetlands can be in the form of bogs, swamps, or marshes. The current amount of Wetland Restoration varies by year; Delaware's goal is to increase the amount annually.

Currently, 1 acre of wetland restoration is cited on State owned lands. The cost of practice installation is up to \$1,702/acre. Funds currently exist for full CRP and CREP wetland restoration installation. Additional funds currently exist for non CRP/CREP style installations. Full implementation of this practice is limited to participants rather than funds. Further education and outreach opportunities will be pursued.

Goal: Delaware's goal is to increase the Wetland Restoration acreage on public lands to 15 acres

- **2011 Goal:** 1 acre.
- **2013 Goal:** 2 acres.
- **2017 Goal:** 8 acres.
- **2025 Goal:** 15 acres.

FUNDING MECHANISM: Property owner incurred costs.

9.6.2.4 Streamside Forest Buffers: Trees planted next to waterways filter and take up nutrients from run-off, stabilize the soil, and provide wildlife habitat.

The current amount of Streamside Forest Buffers varies by year; Delaware's goal is to increase the amount annually by at least 2 acres. The cost of practice installation is up to \$425/acre. Funds currently exist for full CRP and CREP streamside forest buffer installation. Full implementation of this practice is limited to participants rather than funds. Further education and outreach opportunities will be pursued.

Goal: By 2025, Delaware's goal is to increase the Streamside Forest Buffer acreage on public lands to 30 acres.

- **2011 Goal:** 2 acres.
- **2013 Goal:** 6 acres.
- **2017 Goal:** 14 acres.
- **2025 Goal:** 30 acres.

FUNDING MECHANISM: Property owner incurred costs.

9.6.2.5 Streamside Grass Buffers: Grasses planted next to waterways filter and take up nutrients from run-off, stabilize the soil, and provide wildlife habitat.

The current amount of Streamside Grass Buffers is established at 110 acres. Delaware's goal is to increase the amount annually by 5 acres. the cost for practice installation is up to \$300/acre. For 2011, Delaware's goal is to achieve 115 acres of implementation. Funds currently exist for full CRP and CREP streamside forest buffer installation. Full implementation of this practice is limited to participants rather than funds. Further education and outreach opportunities will be pursued.

Goal: By 2025, Delaware will plant 185 acres of Streamside Grass Buffers on Public Lands. The cost of full implementation is \$22,500 for the additional 75 acres.

- **2011 Goal:** 115 acres.
- **2013 Goal:** 125 acres.
- **2017 Goal:** 155 acres.
- **2025 Goal:** 75 acres.

FUNDING MECHANISM: Property owner incurred costs.

9.6.2.6 Agriculture Strategies on DNREC/DDA Lands: Agriculture strategies include adopting applicable actions and practices from the Chesapeake Bay Executive Order Section 502, including cover crops, on Publicly Lands owned and maintained by DNREC, DDA and DeIDOT.

There are currently no acres of DNREC/DDA lands utilizing Agriculture Strategies; Delaware's goal is to expand this to 422 acres by 2012. Additional funding is dependent on the type of BMP.

Goal: By 2025, there will be 4,226 acres managed under Chesapeake Bay EO Section 502 - BMP Recommendations.

- **2011 Goal:** 422 acres.
- **2013 Goal:** 1,266 acres.
- **2017 Goal:** 3,798 acres.
- **2025 Goal:** 4,226 acres.

FUNDING MECHANISM: Property owner incurred costs.

9.6.2.7 Natural Filters on Other Public Lands: Delaware will increase partnerships with local governments, nonprofits, universities, other State of Delaware agencies to implement natural filters on Public Lands.

These are currently evolving BMPs; Delaware's goal is to expand this by 50 additional acres annually. The cost for practice installation is \$300/acre. By 2017, natural filters will cover 450 acres, bringing the cost of full implementation to \$135,000. Funds currently exist for full CRP and CREP natural filters on public lands installation. Full implementation of this practice is limited to participants rather than funds. Further education and outreach opportunities will be pursued.

Goal: By 2025, Delaware's goal is to increase the Natural Filters on public lands to 750 acres.

- **2011 Goal:** 50 acres.
- **2013 Goal:** 150 acres.
- **2017 Goal:** 450 acres.
- **2025 Goal:** 750 acres.

FUNDING MECHANISM: Property owner incurred costs.

9.6.3 New Farming Practices

9.6.3.1 CAFO Setbacks: Manure application setbacks to be implemented on the CAFO operations in accordance with Delaware's recently established State Technical Standards.

There are currently no acres of CAFO Setbacks; Delaware's goal is to expand this by 250 additional acres annually. Additional funding is reliant on regulatory conditions. By 2025, CAFO Setbacks will cover 1,750 acres, with the cost of full implementation dependent on regulatory conditions.

- **2011 Goal:** 250 acres annually.
- **2013 Goal:** 750 acres.
- **2017 Goal:** 1,500 acres.
- **2025 Goal:** 1,750 acres.

FUNDING MECHANISM: Regulatory Program.

9.6.3.2 Cropland Irrigation Management: Crop irrigation is used to decrease climate variability and maximize crop yields. This results in a decrease in runoff and an increase in the crop's ability to uptake nutrients therefore less available for nutrient runoff. Yields are estimated at 20% to 25% higher than non-irrigated fields. Nutrient uptake or irrigated acres are greater, resulting in less residual nutrients remaining in the soil for runoff.

There are currently 60,000 acres of Cropland Irrigation Management; Delaware's goal is to expand this to 65,000 additional acres by 2011. By 2025, Delaware's goal is to increase Cropland Irrigation Management to 135,000 acres.

2011 Goal: 65,000 acres.

2013 Goal: 75,000 acres.
2017 Goal: 105,000 acres.
2025 Goal: 135,000 acres.

FUNDING MECHANISM: Many farmers will adopt based on increase yields and cost effectiveness. However, in 2011 Delaware established the Delaware Rural Irrigation Program (DRIP) Revolving Loan Fund, administered collaboratively through the Delaware Department of Agriculture and the Delaware Economic Development Office. DRIP is a revolving no-interest loan fund available to qualified Delaware farmers to add new irrigation systems including center pivot, linear move, towable systems, span angle systems, corner arm systems, single phase systems or wells and filters associated with drip irrigation systems. The goal is to significantly increase the amount of irrigated cropland in Delaware.

The program works in partnership with any private lending institutions by providing the borrower with no-cost capital equal to the normal and customary equity requirements of a private loan. The loan fund would finance up to 25% of the total project cost, not to exceed \$25,000, at zero interest for a term of no longer than seven years with repayment of principal beginning in year three of the loan. A bank or other lending institution must loan the remaining balance of the project.

Eligibility requirements include:

- Farmers must be actively engaged for at least two years in the growing and harvesting of cash crops such as corn, soy beans, fruits and vegetables in Delaware.
- Farmers must own or lease the land to be irrigated.
- The existing non-irrigated land must be located in the State of Delaware to grow crops.
- Funds may be used to drill new well(s), acquire power units and to fabricate and install new irrigation systems.
- All work must be performed by experienced and qualified contractors licensed by and located in the State of Delaware.
- Project financing is limited to one project per individual farm annually.

9.6.3.3 Vegetative Environmental Buffers: A vegetative environmental buffer is the strategic planting of combinations of trees and shrubs around poultry houses to address environmental, production, and public relations issues by providing a vegetative filter to lower emissions of ammonia, dust, odor, feathers, and noise on a potential of 82 operations. In addition to offering a practical, efficient, and cost effective means of capturing emissions, a properly designed vegetative environmental buffer program can help to conserve energy and reduce air borne pathogens by offering shade and slowing wind speeds, as well as create a more attractive landscape and screen routine operations from view.

There are currently 72 Vegetative Environmental Buffers. Delaware's goal is to expand this to 82 additional Operations for 2011. Additional funding of \$4,000 per system is needed. By 2025, Delaware's goal is to Vegetative Environmental Buffers to 222 Operations.

2011 Goal: 82 Operations.
2013 Goal: 102 Operations.
2017 Goal: 162 Operations.
2025 Goal: 222 Operations.

FUNDING MECHANISM: Cost share funding to offset the costs could be available from the State of Delaware Conservation Cost Share Program and the various Farm Bill programs. Programmatic support is offered through the Delmarva Poultry Industry, Inc.

9.6.3.4 Streamside/Tax Ditch Restoration: A suite of innovative alternative practices designed to enhance the removable of nutrients once they leave the field. These include increasing vegetative buffers that protect ditches from sediment and nutrient runoff. This may include reengineering of drainage channels to reestablish floodplains or redirect storm flows to wetland areas.

There are currently 17,700 linear feet of streamside/tax ditch restoration practices within the Chesapeake Bay Watershed; Delaware's goal is to expand this to 6,000 additional linear feet for 2011. The cost for practice implementation is \$75 per linear foot or \$450,000 for each 6,000 linear feet restored. By 2025, Delaware's goal is to increase Streamside/Tax Ditch Restoration to 41,200 linear feet.

2011 Goal: 6,000 linear feet.

2013 Goal: 35,700 linear feet.

2017 Goal: 41,200 linear feet.

2025 Goal: Maintain 41,200 linear feet.

FUNDING MECHANISM: Cost share funding to offset the costs of Streamside/Tax Ditch Restoration projects is available from the State of Delaware Conservation Cost Share Program and the various Farm Bill programs. Potential funding could be provided through the Chesapeake Bay Grant and the CWA Section 319 Program. Additional sources will be pursued to allow for the increased BMP implementation schedule.

9.6.3.5 Poultry Litter Treatment: A surface application of an acidifier, such as alum, is added to poultry litter to acidify poultry litter and maintain ammonia in the non-volatile ionized form (ammonium). If fully utilized, a potential of 50,000 tons could be treated annually.

Goal: The current extent of use of this practice needs to be fully assessed. Implementation may be occurring voluntarily and not tracked by cost share programs, therefore verification will need to occur. Then, goals for future implementation can be assessed.

FUNDING MECHANISM: Private or exploratory grants.

9.6.4 Evolving Practices

9.6.4.1 Five, ten, and 35 Foot Riparian Buffer Setback: Land conversions and buffers are a good way to achieve nutrient and sediment goals. However, enough funding needs to be available to convince farmers to take land out of production. Buffers are not a popular practice among Delaware farmers as land is taken out of production and forested buffers are said to shade crops and attract wildlife that destroys the crop. Therefore, the Agriculture Subcommittee is reluctant to recommend this practice at substantially increased implementation rates. The Subcommittee at this time only recommends narrow grass buffers as this may be more marketable. A GIS analysis has been done to determine the location, length, and acreage potentially available for additional buffers on agricultural lands in the Chesapeake. To do this analysis, the NHDFlowline layer was clipped to the agriculture portion of the 2007 Delaware land use and land cover

layer (where agricultural lands were identified by codes 211, 212, 213, 240, and 290). The potential for implementation is 852 acres with a 5 foot buffer, 1,706 with a 10 foot buffer, and 5,930 with a 35 foot buffer.

Delaware's goal is to expand Riparian Buffer Setbacks to 250 acres annually. Additional funding is to be determined. By 2025, Delaware intends to have Riparian Buffer Setbacks covering 5,750 acres.

- **2011 Goal:** 250 acres.
- **2013 Goal:** 750 acres.
- **2017 Goal:** 2,250 acres.
- **2025 Goal:** 5,750 acres.

FUNDING MECHANISM: Private or exploratory grants.

9.6.4.2 Phosphorus-sorbing Materials: "Phosphorous-sorbing" materials soak up dissolved phosphorus keeping it from flowing downstream. Engineered systems in which drainage water passes through phosphorus-sorbing materials, such as gypsum, drinking water residuals, or acid mine drainage residuals, can potentially remove large percentages of phosphorus as well as sediment, heavy metals, and other pollutants.

Goal: As this practice unfolds and becomes an acceptable use, implementation potential will be evaluated and installed on a trial scale.

FUNDING MECHANISM: Private or exploratory grants.

9.6.4.3 House Poultry Ammonia Emission Control: Ammonia emission reduction could be achieved by constructing and retrofitting poultry houses with flooring that helps reduce the creation of ammonia. Companies are researching new ventilated plenum flooring (patent pending) for poultry houses that will result in drier litter and smaller waste by using less bedding material and lower ammonia emissions, helping chickens grow faster and healthier.

Goal: As this practice unfolds and becomes an acceptable use, implementation potential will be evaluated and installed on a trial scale.

FUNDING MECHANISM: Private or exploratory grants.

9.6.4.4 Agronomic Improvements: New seed varieties are being developed for additional nutrient efficiency. Current seed varieties are 40% to 50% efficient at utilization and up-take of nutrients. Current test varieties of some new seeds will provide up to 60% efficiency in utilizing available fertilizer.

Goal: Delaware will consider FY 2010 as a baseline for Agronomic Improvements; as such, Delaware's goal is to expand this annually until the full realization of 227,008 acres is achieved in 2017. Additional funding is to be determined.

FUNDING MECHANISM: No public incentive support needed, farmers will adopt based on increase yields and cost effectiveness.

9.6.4.5 Voluntary Practices: A program to conduct farm assessments and inventory of voluntary conservation practices that have been installed but farmers and landowners, since 2005, but are not part of current data inventories.

Capture voluntary practices by hiring someone to collect the data and analyze it. Credit needs to be given for what is already being accomplished. Delaware will work with EPA to ensure that the appropriate data is collected so that it can receive credit in the model. Delaware understands that practices that have been implemented since 2005 and meet EPA protocols can receive credit as progress toward goals and practices implemented prior to that date can be credited when the model is recalibrated. The State will also work to ensure that double counting does not occur. See Appendix H for the form that was used as a case study basis in the Choptank watershed for a performance based Nutrient Management Annual Report, which in the future may be used as a method of capturing voluntary practices.

Goal: Evolving BMP. As this practice unfolds and becomes an acceptable use, implementation potential will be evaluated and installed on a trial scale.

FUNDING MECHANISM: No public incentive support needed, farmers will adopt based on increase yields and cost effectiveness.

9.6.4.6 Carbon Sequestration/Alternative Crops: The NRCS has a practice called long term no-till which they consider a carbon sequestration practice. EPA modelers have indicated that this would instead fall under continuous no-till. Thus, there does not currently appear to be any cost-shared programs that contain this practice.

Goal: Evolving BMP. As this practice unfolds and becomes an acceptable use, implementation potential will be evaluated and installed on a trial scale.

FUNDING MECHANISM: Private or exploratory grants.

9.6.4.7 Alternative Use of Manure: Livestock Manure (primarily poultry litter) generated on Delaware farms is currently applied as fertilizer to Delaware crop fields or transported to areas of need through DDA's Nutrient Relocation Program. A small percentage is pelletized and sold as an organic fertilizer for residential and commercial use through Perdue AgriRecycle. Developing alternative uses for manure produced in the Chesapeake Bay Watershed represents a large opportunity for area farmers. One potential use for the region's excess manure is energy generation. Using excess manure to feed energy generation systems could potentially result in a reduced nutrient load to the Chesapeake Bay, thus improving water quality. The Delaware Nutrient Management Program is committed to seeking out and approving alternative uses of manure provided they prove effective in use and cost efficient in application. Gasification is one example that has recently come to light. The Delaware Nutrient Management Commission will consider this and other options as they become significant and viable.

Goal: There are currently 48,757 tons of managed by the Delaware Department of Agriculture's Nutrient Relocation Program. Three potential alternative uses are approved: Perdue AgriRecycle, mushroom facilities, and manure for steam generation process. The Delaware Nutrient Management Program is committed to seeking out and approving alternative uses of manure provided they prove effective in use and cost efficient in application.

FUNDING MECHANISM: Private or exploratory grants.

9.6.4.8 Revised Phosphorus-Index for Nutrient Management Planning: The Phosphorus Site Index is a site-specific assessment tool that identifies the relative risk for phosphorus losses from agriculture production fields to nearby bodies of water. The Phosphorus Site Index is currently used in the development of agriculture nutrient management plans. Delaware will support development of a revised Phosphorus Site Index that incorporates the best available science in an effort to more appropriately identify the risk for phosphorus loss from agricultural lands. The revised Phosphorus Site Index will offer site-specific management options for reducing off-site phosphorus transport. The process of revising the current Phosphorus Site Index will be conducted in conjunction with the University of Delaware and will mirror the NRCS standard as is currently under development.

Goal: The current acreage under the Revised Phosphorus-Index is currently not quantified. Delaware's goal is to expand the use of the Revised Phosphorus-Index to cover 100,000 acres by 2017.

FUNDING MECHANISM: Private or exploratory grants.

9.6.4.9 Dairy Manure Incorporation Technology: Dairy manure is incorporated into the soil at the time of application utilizing low disturbance technology. Ammonia loss from incorporation will be reduced up to 95% compared to surface application.

Goal: The current acreage under Dairy Manure Incorporation Technology is currently not quantified. The practice will be evaluated and recommended as more information becomes available.

FUNDING MECHANISM: Private or exploratory grants.

9.6.4.10 Poultry Manure Incorporation Technology: Poultry litter is incorporated into the soil at the time of application utilizing minimum disturbance technology which significantly reduces ammonia loss.

Goal: The current acreage under Poultry Manure Incorporation Technology is currently not quantified. The practice will be evaluated and recommended as more information becomes available.

FUNDING MECHANISM: Private or exploratory grants.

9.6.4.11 Windrowing: This is a relatively new practice being pushed by integrators for poultry growers which appears to reduce the amount of poultry litter produced in a year, thus reduces the amount of manure available for field application. The Delaware NRCS cost shares on this practice. The Delaware Nutrient Management Commission is reviewing the implications of this recommendation. As manure generation rates can decrease, the practice is worthy of consideration and further review. The Agriculture Subcommittee is working to quantify the use of this practice and its relative effectiveness so that it can be reflected in the model. Delaware also understands that a representative from the NRCS East Tech Center is reviewing this practice and investigating the potential for additional ammonia emissions. The Agriculture Subcommittee would appreciate reviewing this analysis prior to a determination on the net nutrient benefits of this practice.

Data exists for one chicken farm regarding the impact of in-house, between-flock recycling of chicken litter. This grower, with a 66,000 bird capacity farm, had 350 tons of litter to remove the year before he started

windrowing. In the first year of using the practice, his litter removal amounted to 160 tons and in the second year it was 155 tons. That is a significant reduction that causes the potential of litter-caused nutrients from reaching the waters of the state. DPI has asked the chicken companies to share information about their experiences with windrowing litter reductions.

Goal: Receive credit for the 9 acres currently implemented; expand BMP as warranted.

FUNDING MECHANISM: Private or exploratory grants.

9.6.4.12 Poultry House Remediation: NRCS has begun cost sharing on this practice which decommissions abandoned poultry houses. The roofing of abandoned houses is often removed as scrap metal and when it rains, the nutrient rich floors leach into groundwater. The amount of legacy nutrients under poultry houses is sizable. This practice removes and composts the wood materials and soil below the house to eliminate this pollutant source. Research by the University of Delaware is currently being conducted to quantify the benefits of this practice so that it can be added to the Bay Program Model. Agriculture Subcommittee representatives are eager to work with EPA to factor this practice into the model.

Goal: Receive credit for the 6 houses remediated in the Chesapeake; expand BMP as warranted.

FUNDING MECHANISM: Private or exploratory grants.

9.6.5 Evolving Initiatives

The following items are examples of programs that are recommendations that include BMPs but, additionally, reach beyond the traditional scope. They are ways of rewarding BMP implementation, thereby, encouraging additional participation by landowners. This section also includes mechanisms to expand programs that protect or encourage active agricultural lands within the Chesapeake Bay Watershed.

9.6.5.1 Certainty - This Department of Agriculture and DNREC have been exploring the potential of "Agricultural Certainty". Certainty is a voluntary approach to provide assurances to farmers or groups of farmers so they may conduct business in a predictable regulatory setting for a prescribed time period in exchange for their implementation of additional best management practices and/or adjusting operational approaches to achieve enhanced environmental benefits.

Over the past several months, we have had discussions with representatives of the USDA and the EPA. We have also hosted two workshops to define and refine the Certainty concept with, first, our peers in Chesapeake Bay states and, at a second meeting, with representatives from the Non-Government Organizations from the agriculture spheres and the environmentalists' spheres at the same time. At the conclusion of these exploratory efforts, we have decided to pursue the Ag Certainty concept further.

We are currently seeking significant stakeholder input to identify programmatic elements that make sense for our agricultural community, to determine levels of positive environmental impacts from those programs, and to discern thresholds of implementation that warrant recognition for certainty. We view Certainty as one of the many possible methods of helping us achieve the needed environmental improvements required in our Watershed Implementation Plans. This program development effort will result in a significant amount of work. Perhaps an even greater workload for the States will occur if certainty programs become reality.

We are currently working with USDA and USEPA in an effort to gauge their sincere interest and support for Certainty programs. We have asked each of agency to participate in the program development stage over the next few months. At the end of the program development process, we will also seek significant assurance that the USDA and EPA will not only support the program with available financial and programmatic resources, but will formally agree to provide full endorsement and assurance that the programmatic rules and regulations of a certainty program will not be altered or impacted by federal action. In short, we need the assurance that federal action will not “trump” state certainty programs for an agreed upon time frame consistent with each state’s program.

9.6.5.2 Cost Share Program Modifications

1. Investigate ways to streamline paperwork required for application and payment.
 - NRCS has undertaken the Conservation Delivery Streamlining Initiative. As they fully implement key parts of the CDSI, it anticipates features where:
 - Technical field staff can spend as much as 75% of their “conservation assistance” time in the field with customers (if needed) to deliver planning, application, and financial assistance.
 - Over 80% of the time currently spent by technical staff on administrative or clerical financial assistance tasks are eliminated, automated, or reassigned to other staff.
 - Alternative financial assistance approaches and business processes streamline the “administrative” time between a program application and funding decision to two weeks or less.
2. Piggy back existing cost share programs to increase cost share rates on key BMPs to 80-85%. Targeting other non-NRCS sources to increase the cost share rate for practices like buffers is likely needed to increase participation.
3. Discuss with NRCS about the possibility to raise ceiling if appropriate/needed and allow repeat acres to get EQIP cost share on practices that are economically infeasible for farmers without cost share. May need to also consider obtaining/targeting state funds to the practices that this issue pertains to also.
4. Provide for increased financial incentives to producers willing to commit to utilizing targeted BMPs over a longer period of time. Cost share rates would increase as the number of years of a contract increases. A one year commitment to utilize a BMP would be funded at a lower rate than a five year commitment to utilize a BMP.
5. Investigate programmatic changes to provide flexibility for producers who participate in cost share programs. Producers do not like to enter into long term contracts because it limits their ability to respond to changes in commodity markets. Providing flexibility without penalty could increase participation.
6. Increase the level of technical assistance used to do follow-up with producers that have existing contracts. If staff spends time with producers who have contracts, there is an increased probability that those producers will fully implement their contract.
7. Increase/target information and education activities that stress the importance of improving water quality in communities where producers live. Convincing producers that the water quality where they live can be improved by implementing BMPs will aid in increasing participation. Additionally, the economic benefits of these practices should be communicated so that implementation may occur voluntarily and not rely on cost-share programs.
8. Identify ways to increase funds available for cost-share programs.

9.6.5.3 Property Taxes: Use increased education and outreach to remind poultry growers that might be reluctant to install certain structural BMPs on farms that the value of those structures is not included in county and school district property taxes. House Bill 470 exempts from taxation “any lands, buildings, and improvements upon which are situated, or which are in active use as, structures and facilities which are required by, and used for the purposes of nutrient storage, disposal, or management pursuant to, a nutrient management plan required pursuant to 3 Del. C. Chapter 22.” To receive an exemption, a poultry grower must notify the county of the existence of the qualifying land, buildings, or improvements and request the exemption. Lower assessments will be effective for county property tax bills prepared in 2005, but they are not automatic. Property owners must apply for the reduced assessments.

- In Sussex County, growers can seek the exemption by calling the Assessment Office at 855-7824. A county employee will check the use of the building before an exemption is approved.
- Kent County poultry growers need to send a letter seeking the exemption to the Kent County Assessment Office, 414 Federal Street, Dover, Delaware 19901.
- In New Castle County, letters should be mailed to Andrew Marinelli, Department of Finance, Assessment Division, 87 Read’s Way, New Castle, Delaware 19720.

The Agriculture Subcommittee will also explore if there is a way to automate this process so that the burden will not be on the farmer to apply.

9.6.5.4 Cost-Share as Income: Under the Internal Revenue Code (IRC), some cost share payments are considered to be income to farmers and therefore subject to federal income tax. Because Delaware and most other states “piggyback” on the IRC, these cost share payments would also be taxable at the state level. In light of their tax consequences, the inclusion of these payments as taxable income may discourage some chicken growers from installing BMPs. Likewise, excluding cost share payments from taxable income might encourage more cost share participation. The most effective means – both in terms of environmental effectiveness and ease of tax administration – would be to amend the IRC to specifically exclude cost share payments from the definition of taxable income. This is true because it would:

1. Extend the reach of the incentive to all states in the region that piggyback on the IRC;
2. Eliminate the need to pass bills in multiple, cash-strapped states; and
3. Eliminate the need to establish duplicative tax processing regimes in multiple states.

9.6.5.5 Expand Farm Preservation: Keeping working farms as working farms is a good way to prevent additional pollution from developed property. Expanding state farmland preservation money could help some farmers permanently extinguish their development rights.

Other points/considerations:

- Should also establish a young farmer program
- There’s an estate tax for passing down a farm. It sunsets this year.
- Maryland allows a longer time for a family to figure out what to do with the farm (3 years vs. 9 months); Gives the family time to weigh options, save for taxes, etc.

9.6.5.6 Correct the Model Assumptions:

Delaware has manure analysis data which indicates that both the poultry manure volume and nutrient content used in the model should be corrected. Delaware is leading a special task force of the Chesapeake Bay Program Ag Working Group to assess this situation further and make recommendations

to the Ag Working Group and then to Water Quality Goal Team. The example below illustrates the difference and points to the potential impacts.

Table 40: Difference Between EPA and Delaware Manure Analyses

	EPA/ASAE	
	Approach	units
Bird Inventory	43,620,576	# of birds on any given day (2007 Census)
Animal Unit Definition	455	# of birds per 1000 lbs of animal mass
Total Animal Unit Inventory	95,869	animal units on any given day
Manure Production	85	lbs of manure per animal unit per day
Total Manure Produced	1,487,174	tons wet excretion per year
Nitrogen Concentration	0.0129	lbs TKN per lb of manure
Phosphorous Concentration	0.0035	lbs Total P per lb of manure
Total Nitrogen Produced	38,491,563	lbs Total N per year
Total Nitrogen Not Volatized	35,332,221	lbs Total N per year
Total Phosphorous Produced	10,497,699	lbs Total P per year
Total Phosphorous Produced with 16% phytase credit	8,818,067	lbs Total P per year

	UD/DDA/UMD	
	Approach	units
No of Birds	43,620,576	# of birds
No of Flocks per Year	4.8	flock per year
Total Number of Birds Produced	209,378,765	birds per year
Manure Production	1.25	tons per 1000 birds
Total Manure Produced	261,723	tons per year
Nitrogen Concentration	56.80	lbs Total N per ton
Phosphorous Concentration	19.50	lbs Total P per ton
Total Nitrogen Produced	14,839,720	lbs Total N per year
Total Phosphorous Produced	5,103,607	lbs Total P per year

9.7 Minimize Funding Gaps

Since most of the lands within the Chesapeake in Delaware are agriculture, there is a need to increase BMPs on these lands, and therefore, there is a need to maintain and increase the funding sources for some BMP programs. Various alternatives to filling this funding gap should be considered.

Realizing a significant boost in funding will be warranted for full implementation, it is imperative Delaware pursue increased funding through State programs such as the State of Delaware Conservation Cost Share, Delaware CREP, Delaware Nutrient Relocation, Delaware CAFO, and Delaware Nutrient Management Programs. Representatives from DNREC, DDA, and the Conservation Districts have expressed this need, especially for cover crops, to the Delaware General Assembly in 2012. While budget restrictions may not allow for substantial increases during FY2013, each organization is committed to this issue and will continue to petition the legislature for the increased funds for conservation programs in the coming years. In addition, to accommodate easier land owner participation by private landowners, the State of Delaware Revolving Loan Fund should be review and expanded to allow additional BMP funding as applicable.

Likewise, it is essential federal programs, such as EQIP and the Chesapeake Bay Program Implementation Grant, be expanded within the Chesapeake Bay Watershed to account for additional funding needs. Delaware is committed to working closely with USDA Programs (NRCS, FSA, Rural Development), EPA, US Energy Department, US Fish and Wildlife, and Army Corp of Engineers to assure additional federal resources will be available to accommodate the BMP recommendations made within the contents of this document. If additional federal funds are available, the Delaware General Assembly may be more inclined to match those funds with new State dollars to advance the effort.

As additional funding needs will certainly be warranted, private grants and/or exploratory grants will also be pursued. Other evolving initiatives, such as a potential offset and/or trading program, may also serve as a new source of funds to support the very cost effective agriculture BMPs identified in this plan. Additionally, if a Certainty Program is established, while it would not generate revenue to support BMP programs, may accelerate the voluntary implementation of various practices and help achieve WIP goals.

Finally, funds should be used most efficiently and the most effective practices for improving water quality should receive funding priority. Discussions between local, State, and Federal agencies in Delaware on this topic have already begun and transitions will hopefully occur over the next few years. Several of the practices that have the most impact on water quality take land out of production, which many farmers may find objectionable. For this reason, there is need to carry out a campaign of communication and outreach to connect with agricultural producers to convey expectations and ensure implementation of these most effective agricultural BMPs. Delaware is also committed to pursuing the additional staffing level needs.

9.8 Contingencies

If delays in adoption of new or revised legislation, regulations, local ordinances, and/or permit issuance occur, Delaware will consider the following actions related to agriculture:

- Delaware commits to review and evaluate the pace and progress of Ag BMP implementation at the end of 2013. If needed, Delaware will enact new policy measures and explore mandatory BMP compliance options in a timely manner to ensure that water quality commitments will be met.

- Consult with University of Delaware, other academic institutions, DDA, USDA and DNREC to examine the possibility and implications of prohibiting manure-source phosphorus application on high phosphorus soils.
- If participation rates with voluntary, incentive-based programs are not achieved with respect to CAFO regulations, when EPA modifies the federal regulations for CAFOs, DE will review for gaps.
- If compliance rates with regulatory programs are not achieved, the contingency plan is to increase educational efforts for voluntary programs if also necessary.

9.9 Tracking and Reporting Protocols

Best management practices (BMPs) to reduce nonpoint source (NPS) pollution are funded and installed by numerous federal, state, local, and private agencies. DNREC's Watershed Assessment Section in collaboration with the Office of Information Technology (OIT) obtains nonpoint source BMP tracking data from both these internal and external sources, which are then reported to the EPA Chesapeake Bay Program Office (CBPO) for inclusion in model scenario runs. Each December 31st, data for projects that were implemented between July 1 and June 30 is submitted to the Program in order to receive credit toward progress in reaching water quality goals.

In an attempt to standardize, streamline, and document data manipulations, the Chesapeake Bay Program and the jurisdictions in the bay watershed agreed to transfer data exclusively through the National Environmental Information Exchange Network (NEIEN). The Exchange Network is a partnership between the Bay jurisdictions and the CBPO for the secure, real time exchange of environmental information. Existing data management systems are able to remain in place and through the Network, data is delivered based on pre-described methods, or a schema. The CBP NPS BMP schema was developed by PA, VA, and MD. Delaware began mapping data from state sources into the schema. The schema in use contains fields such as jurisdiction, data source, contact information, name of practice, practice components, location, unit of measure, quantity, status, and funding source.\

In Delaware, data from each implementing organization is supplied to DNREC's OIT for conversion into an XML document. Once all data sources have been received, data is transmitted through DNREC's network node. Once data is submitted as XML documents through NEIEN, it is entered into the Nutrient and Sediment Scenario Builder which creates input scenarios for the Watershed Model. The transition to the NEIEN reporting system will streamline the reporting process and will result in use of agreed upon data entry fields to minimize data entry errors, standardize data input and management procedures, and unify reporting from multiple agencies.

The 2010 data submission was the first done with NEIEN. Since the transition to NEIEN, more data on practices that have routinely been implemented within the State can finally be reported and credited within the Bay Program model. Improvements in data tracking and reporting systems have resulted in the reporting of more practices that receive credit in the watershed model and the capture of data fields that were previously missing or unpopulated. Additionally, in 2010, an agreement was reached to have federal agencies, such as the USDA's NRCS and FSA, report practices directly to the USGS for CBP modeling rather than have jurisdictions report on their behalf. While the intricacies of this agreement are being worked out, Delaware worked with Tetra Tech to map NRCS data to the schema for the 2010 data submission.

There are still sources of data that have not been reported and we need to work on incorporating them into our reporting system. Sources that have already been identified include the Farm Service Agency (FSA), the city of Middletown stormwater data, water control structure data from three conservation districts, and data from local governments on tree planting and street sweeping. DNREC staff will assist with obtaining data in appropriate spreadsheet formats so that Tetra Tech staff can focus on XML development. Additionally, we need to work with the agriculture community to determine the extent of any voluntary implementation of BMPs and identify methods to incorporate that information into regular reporting systems.

9.10 Sea Level Rise Considerations

Low-lying agricultural areas, along with tidal wetlands, are expected to be some of the first areas to experience the impacts of sea level rise. There is potential for active agriculture lands and lands with highly productive soils in the Nanticoke Watershed to be inundated by sea level rise under the various 0.5, 1.0, and 1.5 meter scenarios (Table 41). As wetlands migrate inward, adjacent agricultural lands may become too wet to farm. In addition, salt water intrusion poses a threat to lands under irrigation, although these potential impacts are poorly understood at this time. These combined effects may impact the types of crops that can be grown and overall yield and may impact the health of domestic livestock that need fresh water. Communities planning to preserve agriculture should consider the potential need to migrate agricultural operations inland. Additionally, since Delaware's WIP relies heavily on implementing by 2025 and maintaining into the future agricultural BMPs to improve water quality, their placement and potential longevity should be considered so that those investments are protected. Additionally, forested and grass buffers can be used not only for water quality improvements but also a first line of defense against sea level rise. Expanding programs that provide cost share to these practices would support not only water quality initiatives, but sea level rise preparedness as well.

Table 41: Existing Agricultural Lands within Potential Sea Level Rise Inundation Areas

	0.5 Meter Scenario	1.0 Meter Scenario	1.5 Meter Scenario
Acres of Agriculture	4.5	13.7	38.5

SECTION 10. RESTORATION

The Restoration Subcommittee was assembled to address the eight elements identified within the Chesapeake Bay Watershed Implementation Plan (WIP) as they relate to restoration activities in Delaware. The Restoration Subcommittee represents a diverse array of programmatic expertise from both federal and state agencies that are actively involved in ecological restoration in the State of Delaware. In addition to members from DNREC (Watershed Assessment Section, Drainage Program, and Division of Fish and Wildlife), representatives from the DDA's Forestry Program, DelDOT, and the US Fish and Wildlife Program were involved in this subcommittee. They focused on identifying existing ecological restoration projects within the Chesapeake Basin of Delaware, developing an ecological restoration database that can be used to track and identify potential restoration projects, and devising recommendations and ecological restoration goals to help achieve the soon to be established Chesapeake Bay TMDLs. The Subcommittee has met numerous times since February in 2010 and has regularly corresponded by email to accomplish its tasks.

Approximately 25% of Delaware is covered by wetlands, with over 320,000 acres of inventoried wetlands. About one third of the wetland area is tidal and two thirds is non-tidal. The U.S. Fish and Wildlife Service (USFWS) in partnership with the state used photos and soil mapping to determine that Delaware has lost close to 54% of its wetlands statewide since the 1780s. From 1980 to 1992, significant acres of forested wetlands were lost because of agricultural activities and development. Recent losses from 1992 to 2007 have resulted in conversion of almost 3,900 acres of wetlands to urban development and to crop land. Annual wetland loss rates have increased statewide in the most recent analysis. The Chesapeake Basin encompasses about 35% of Delaware and this basin lost 45% of the 3,900 acre total. In addition to acreage losses, existing wetlands are exhibiting diminished functioning due to surrounding land use.

10.1 Current Programs and Capacity

10.1.1 Department of Natural Resources and Environmental Control

Ecological restoration efforts by DNREC in the early 1990s began with the conversion of a few marginal agricultural fields into wetlands. Most of this restoration was initiated by landowners interested in carrying out restoration projects on their properties, and very few of these restoration projects resulted from are permit activities within the State. Since then, efforts have expanded to include the restoration of tidal and fresh water wetlands, streams, man-made drainage channels (tax ditches), and riparian corridors (the area within and adjacent to a stream). DNREC's Secretary Hughes established the Ecological Restoration and Protection Team in the fall of 2003 and made it responsible for implementing stream and wetland restoration projects throughout the state. The team brought together expertise and resources from various agencies within and outside DNREC; however, in the past few years the Team has not been functioning. Delaware has several other State agencies, such as DelDOT, as well as federal agencies, including the USFWS and NRCS that have assumed the role the Ecological Restoration and Protection Team had in implementing restoration projects for Delaware's wetlands, streams, ditches and upland forest.

10.1.1.1 The Watershed Assessment Section

In 2004 the State of Delaware committed to assess its wetland resources as part of their overall water monitoring strategy by developing the necessary assessment methods that would determine the condition of state's wetlands and the threats that currently impact them. Wetland staff from the Watershed

Assessment Section used these methods in the Nanticoke Watershed to determine the condition of wetlands and the stressors that affect the condition of the wetlands. From these wetland assessment activities and existing information on wetland and forest activities in the Nanticoke watershed, a [Restoration Plan](#) was developed by a multi-disciplinary working group made up of representatives from DNREC's former Divisions of Fish and Wildlife, Parks and Recreation, Soil and Water Conservation, and Division of Water Resources; Delaware Departments of Agriculture and Transportation; Natural Resource Conservation Service; United States Fish and Wildlife Service; The Nature Conservancy; Nanticoke Watershed Alliance; Nanticoke Tributary Action Team; and Duffield Associates, Inc.

The Nanticoke River is a major tributary of the Chesapeake Bay, draining approximately 2,072 square kilometers (800 square miles) in the states of Maryland and Delaware (CBF 1996). The watershed is over 88.5 miles long and the total rise in elevation is only 19.8 feet, giving the river a very low gradient (Tiner et al. 2000). The river is tidal along the major channels, up to dams located on Broad Creek in Laurel, Delaware and on Deep Creek in Concord, Delaware.

The Nanticoke River watershed has been a focus for protection because of its abundance of rare fauna and flora and unique biological communities. The Nature Conservancy listed the Nanticoke River watershed as one of their "Last Great Places" and has targeted significant conservation efforts in this region (TNC 1998). In Maryland and Delaware there are approximately 200 plant species and 70 animal species that are state rare, threatened or endangered, including over 20 plant and 5 animal species that are globally rare (TNC 1998). Many of these species are found in rare natural communities in the watershed including coastal plain ponds, xeric dunes, and Atlantic White Cedar swamps.

The Nanticoke is also important for waterfowl and fisheries, is a focus area of the North American Waterfowl Management Plan, and is a reintroduction site for American shad (*Alosa sapidissima*). Due to land use practices in the watershed, many of the natural systems have been degraded. This has impacted natural populations of fish and wildlife, and decreased the ecological services that these systems provide such as water quality improvement and flood protection. At the time of European settlement, the land was predominately forested, and has been estimated to have had as much as 95% old growth mixed species forest (Tiner and Bergquist 2003). Large blocks of forest remain, but many of these forest stands have been highly fragmented and/ or converted from the original mix of hardwood species to extensive pine plantations, and there are no known remaining old growth forest stands.

In the Delaware portion of the watershed, Tiner (2004) estimated that 41% of the land area remains in natural vegetation (Tiner 2004). The remaining 60% is dominated by agriculture (not including forestry). In recent years, however, development has been increasing in the watershed. Another stressor impacting natural communities in the watershed is channelization of streams and expansion of ditch networks into the headwaters of the watershed to increase drainage. Tiner et al. (2001) estimated that 80% of the natural streams have been channelized and there are 2.3 miles of ditches per square mile of land in the Delaware portion of the watershed. Channelization impacts adjacent wetlands by reducing the residence time in these wetlands. Channelization typically results in depositing spoils along stream channels, further isolating floodplain wetlands by preventing overbank flooding.

Much of the restoration plan's goals were formed based on the knowledge gained from the Nanticoke watershed's wetland assessment. The results from the sites sampled for wetland condition determined that 17% of the non-tidal wetlands are considered minimally or not stressed. Of the remaining wetlands, 48% were moderately stressed, and 35% were highly stressed. Dominant stressors impacting wetlands and

lowering their conditions were hydrology alterations due to ditching and vegetative alterations caused by forestry practices, which alter species' structure and composition. The Nanticoke Watershed Condition Report recommended that wetland restoration and protection activities need to be integrated into larger landscape level plans to ensure that wetlands can perform functions and provide ecosystem services, as well as support sustainable restoration activities. The Nanticoke Restoration Plan is to be the basis for Delaware's initial implementation goals for the Chesapeake Bay Watershed Implementation Plan (WIP).

Table 42: Nanticoke River watershed high priority conservation targets

Conservation Target	Definition	Importance to maintaining ecological integrity of Nanticoke Watershed
Expand and enhance headwater forests/ large forest blocks	Forested areas that are or have the potential to be expanded to 250 acres in size by reforesting adjacent lands. 250 acres was based on the definition of forest blocks from the Delaware Wildlife Action Plan (DE NHP 2006). Because of the Delaware portion of the Nanticoke River watershed includes the headwaters of the river and major tributaries and extends only where tidal influence begins we considered all portions of the watershed in Delaware to be headwaters.	Headwater forests in Delaware are typically a mosaic of wetland and upland systems. Large blocks of forests provide habitat to sustain wildlife populations, store carbon from being released to the atmosphere, improve air quality and intercept runoff and atmospheric deposition of nitrogen.
Restore channelized streams	Channelized streams are waterways that were historically natural streams and have been deepened and straightened to increase drainage primarily for agricultural lands.	Restoration of channelized streams to natural flowing streams will re-connect the stream with the floodplain and adjacent wetlands. An intact stream/ wetland system will improve habitat for wildlife, reduce flooding downstream by providing greater storage during storms and reducing the flow of flood waters, improve water quality by waters interacting with the adjacent wetlands to remove sediment and transform nitrogen and phosphorus.
Expand riparian and tidal wetland buffers	Buffers are defined as lands within 50m of streams, rivers and tidal wetlands supporting native vegetation.	Expanding buffers will benefit wildlife through improved habitat, providing shade to streams, and serving as corridors to connect large forest blocks. Buffers also improve water quality by retaining sediment and intercepting nutrients.

The Restoration Subcommittee used the best available science and diverse expertise of participants to identify conservation targets and locate these targets on the ground. Priority areas were identified for each conservation target based on different program goals, including: habitat restoration, water quality improvement, and stream biology/ habitat improvement. The restoration plan is to be updated and refined on a regular basis so that new information can be incorporated, and optimal areas for restoration found. The conservation targets that had the highest priority were:

Table 43: Conservation Targets with Highest Priority

Conservation Target	Identified for potential restoration	Goal with CB implementation grant (2010-2013)
Headwater forests/ large forest blocks – enhancement	35,739 acres (14,463 ha) Wetland	* could count as part of the wetland re-establishment goal
	30,087 acres (12,176 ha) Upland	* could count as part of upland re-establishment goal
Headwater forests/ large forest blocks – re-establishment	40,489 acres (16,385 ha) Wetland	80 acres
	51,998 acres (21,042 ha) Upland	264 acres
Restoration of channelized streams	1,015 miles (1, 634 km)	
Riparian and tidal wetland buffers	45,106 acres (18,254 ha) Riparian buffers	* could count as part of upland forest re-establishment
	736 acres (298 ha) tidal wetland buffers	

The Nanticoke Restoration Plan identified priority areas for restoration, and instituted an ad-hoc workgroup to assist restoration activities. The Chesapeake Bay Program Implementation Grant and the Division of Fish and Wildlife Landowner Incentive Program (DELIP) provided funding to DNREC's Watershed Assessment Section for staff to implement these prioritized projects. Specifically, these grants funded a coordinator to facilitate the process, develop a database of potential projects, track landowner contacts and accomplishments, and report acreage of restoration within each conservation target to the appropriate groups in the CBP.

Watershed Assessment initially used existing staff to start implementing the Restoration Plan but due to work loads and amount of time needed to establish project(s), Watershed Assessment hired a new staff member to implement the plan. Several attempts were made to hire implementation coordinator, but no qualified individual applied for the grant funded position. An agreement was developed with Ducks Unlimited to act as a coordinator to find and initiate restoration projects within the Nanticoke watershed. The Ducks Unlimited agreement has ended; however that agreement did result in some potential projects. Watershed Assessment is working on re-establish that agreement. The United States Fish and Wildlife Service have established a position to be used to implement the projects initiated by Ducks Unlimited. Those projects initiated are discussed in Subsection 10.4.2.

10.1.1.2 Drainage Program

Delaware has 228 individual [tax ditch organizations](#), ranging in size from 56,000 acres in Marshyhope Creek Tax Ditch in southern Delaware, to a two-acre system in Wilmington. These organizations manage over 2,000 miles of channels and provide benefits to over 100,000 people and almost one-half of the state-maintained roads. Tax ditch channels range in size from 6 to 80 feet wide and 2 to 14 feet deep. The dimensions depend on the acreage being-drained, and the topography.

Most of Delaware's tax ditch channels have been listed on Delaware's Clean Water Act 303 (d) impaired waters list, and are included in State-developed nitrogen and phosphorus TMDLs. Within Delaware's Chesapeake basin, there are 206 tax ditch organizations containing approximately 1,500 miles of drainage channels. These channels were established to manage water resources from 64% of the basin drainage area. It is estimated that an additional 1,500 miles of *private* channels exist throughout the basin. These drainage channels are maintained to manage soil and water resources for efficient farming operations as well as resolve drainage and flooding problems for cities, towns, roads, and urban areas. These drainage channels have been linked to the contribution of excess sediment and nutrient problems in streams, rivers, and estuaries of the Chesapeake Bay as they transport nutrient and sediment enriched waters downstream.

During the early 1990s, DNREC focused on constructing environmentally friendly water management projects that minimized environmental impacts from the construction and maintenance of tax ditches. This list has evolved into Delaware's Tax Ditch BMPs. Some of the highly significant practices are to:

- Perform one-sided construction
- Minimize clearing widths through forested areas
- Relocate channels around sensitive and/or significant habitat or wetland areas
- Minimize construction of downstream outlets
- Block off old channels that drain only wetland areas

To ensure implementation of these BMPs, DNREC routinely provides wetland/environmental training sessions for both technical and administrative staff members. DNREC has constructed many projects incorporating these BMPs to test their effectiveness. These projects have resulted in the establishment of demonstration and education sites that have shown how drainage and environment quality do not have to be mutually exclusive.

10.1.1.3 Delaware Landowner Incentive Program

DELIP offers private landowners, technical and financial incentives to protect, enhance and/or restore habitat to benefit Species of Greatest Conservation Need (SGCN). The program's focus is on wildlife habitat for SGCNs. Some water quality benefits may result from these habitat restoration projects, depending on the practice and its location on the landscape. Practices range from creating shallow water wetland habitats for migratory shorebirds, and controlling invasive species in bog turtle habitats, to establishing native warm season grasses for upland sandpipers, and planting trees for the Delmarva fox squirrel. Other eligible practices include wetland restoration and enhancement, riparian forest and grass buffer establishment, upland early successional habitat enhancement, reforestation, selective thinning and invasive species control which will directly benefit SGCN. Administered by the Division of Fish and Wildlife,

this program will pay qualifying landowners 75-100% cost-share. In return, the landowner must sign a conservation agreement to manage and maintain the restoration for a period of five or ten years. In addition, landowners may receive \$148/acre/year for practices established on agricultural lands.

Financial assistance may also be received in the form of a conservation easement with DELIP. An easement is a legal agreement between the property owner and the conservation organization. It restricts development on the property for either a termed period or in perpetuity. The landowner still retains ownership of the land and the right to work and sell the property. Payments are based on the fair market value of foregone development.

10.1.2 Delaware Forest Service

Annually, Delaware Department of Agriculture, Forest Service has State funds available for forestry practices statewide. Half of these funds are allocated toward urban forestry practices, including tree planting sub-grants and tree maintenance sub-grants. The other half is allocated to rural forestry projects. Sub-grant recipients are required to match with non-State funds at a 1:1 ratio. The Program is available statewide, with no special considerations based on watershed location.

The Forest Service completed a comprehensive five-year strategic plan in 2008 with assistance from 40 participants representing a variety of stakeholders, including other public (state, federal, local) agencies, landowners, nongovernmental organizations, consultant foresters, forest industry, and recreationists. Through this effort, the stakeholders identified the critical issues facing Delaware's forests and then defined goals and objectives for the DFS to address in the subsequent five years (2009-2013). Second, Delaware's Forest Stewardship Committee participated in a facilitated process in 2009 to identify the issues, threats, and opportunities facing the State's forests. Beginning with the issues from the strategic planning process, the committee identified additional issues, and then outlined specific threats and opportunities. The result was very similar to the outcomes of the strategic planning process. Four issues were identified: (1) Forest Health and Functionality; (2) Forest Markets; (3) Sustainable Forest Management; and (4) Public Awareness and Appreciation of Forests.

10.1.3 Delaware Department of Transportation

The Delaware Department of Transportation is responsible for maintaining existing state roadways as well as the design and construction of new roadways. DelDOT mitigates for some ecological impacts, primarily to wetlands, caused by its road building activities. DelDOT wants to integrate its mitigation projects within the framework of the State's Chesapeake Bay WIP and Delaware's existing TMDLs in other parts of the State, which are implemented through a Pollution Control Strategy in order to improve water quality and make optimal use of existing state funds. The Restoration subcommittee has been working toward that goal.

10.1.4 US Fish and Wildlife Service and Natural Resource Conservation Service

The US Fish and Wildlife Service's program in Delaware assists NRCS in the implementation of Farm Bill programs primarily through the Wetland Reserve Program and Conservation Reserve Program. The BMPs are the same for NRCS: wetland restoration, ditch plugs, warm season grass buffers, and tree planting. The USFWS has contributed approximately \$40,000 toward restoration projects in Delaware over the past three years, primarily in the form of acquiring tree seedlings for CREP projects.

10.1.5 Clean Water State Revolving Fund Land Conservation Loan Program

An innovative financing approach is being developed to fund land conservation easements and possible fee simple land purchases with Clean Water State Revolving Fund (CWSRF) municipal loans. A five-year pilot program has been approved (up to \$5.0 million per year subject to funding availability) to fund a CWSRF Land Conservation Loan Program. Annually, municipalities that have wastewater projects on the CWSRF Project Priority List (PPL) can enter into sponsorship agreements with implementing partners such as the Delaware Department of Agriculture's (DDA) Forestland Conservation Program, Agricultural Lands Preservation Program, and DNREC's administrated State Open Space and Wetland Conservation Programs, to conserve forestland, open space, and wetlands. Funded land conservation easements and/or fee simple land purchases must have demonstrated water quality improvement benefits, be managed in perpetuity, and be purchased at a significant discount to their appraised value.

The CWSRF program will provide funding for traditional wastewater projects loans in addition to loan dollars for forestland, open space, and wetlands land conservation easement projects with discounted interest rates. These loans will be designed to ensure that municipalities will not pay any additional loan debt service payments annually or over the life of twenty (20) year wastewater project loans by borrowing additional funds for land conservation projects. EPA has acknowledged that fee simple land purchases in addition to easements are eligible as well under the program.

10.2 Accounting for Growth

With the exception of DelDOT mitigation projects, most restoration projects occur on a volunteer basis, so they are scattered throughout the State. In recent years, there has been some coordination between the agencies in implementing these restoration projects. This coordination, however, has not resulted in an influx of new projects. EPA's desire to delist impaired water bodies within the State has caused a concerted effort to work in smaller subwatersheds, most of which lie outside the Chesapeake Basin.

Since most of the restoration projects within State were the result of willing property owners and not the result of regulatory actions, increasing restoration actions as a result of growth within in the Chesapeake Watershed will require some interagency coordination and cooperation. The Restoration Subcommittee is working on developing a plan or guidelines to integrate ecological restoration projects into state-wide objectives on a watershed basis. The Subcommittee is incorporating the recommendations from the Nanticoke Wetland Restoration Strategy and the Department of Agriculture's Statewide Forest Assessment Report into the WIP.

The Restoration Subcommittee is verifying existing wetland restoration sites and will enhance an existing database for tracking restoration throughout the state, not just the Chesapeake Bay portion of Delaware. The existing database does not serve the needs of every program and needs to be re-vamped. Each agency has evaluated their data within the database to determine if their restoration data is accurate for their projects and also determine if any projects were left out.

As of October 2011, the revised restoration database was developed and was populated with wetland and forestry restoration data. Once the data enter has been verified a prioritized list of potential restoration projects will be developed. As funds from grants and other sources become available, agencies can consult the database to find a suitable project within a specified watershed.

The Restoration Subcommittee does not think that their proposed restoration goals will be completely met by regulatory wetland mitigation actions resulting from ditching activities and/or state transportation projects. With promulgation of new storm water regulations (see Section 7), an offset or trading program will be developed for those projects that cannot meet water quality requirements of the new storm water regulations, likewise for land use changes (See Section 8). In addition, there may be opportunities for additional offsets resulting from the State's issuance of National Pollutant Discharge Elimination System (NDPES) permits. Regardless of whether regulatory processes result in additional restoration projects, the State wants to more aggressively pursue ditch, stream, and wetland restoration projects. These priority projects will be chosen from the list of projects in the Nanticoke Restoration Plan and the Department of Agriculture's Statewide Forest Assessment Report and will result in quantifiable nutrient and sediment reductions.

10.3 Gap Analysis

To achieve additional nutrient and sediment reductions through restoration activities, there are data and funding gaps that must be closed first.

10.3.1 Data Gaps

In the Coastal Plain, for a constructed or restored (emergent to forested) freshwater wetland, when the functionality of the wetland is established, nutrients that enter the wetland could be reduced 25% for nitrogen, 50% for phosphorus, and 15% for sediment. The estimated total nitrogen load reduction for a two to five acre wetland ranges from 88.2 to 220.5 pounds of total nitrogen per year. The estimated total phosphorous load reduction for a similar sized wetland ranged from 3.4 to 8.4 pounds of total phosphorous per year. Using the database that DNREC developed to track restoration projects, since the 1990's, 4092 acres (205 acres per year) have been restored and 590 acres (30 acres per year) of wetlands have been created within the Chesapeake Basin in Delaware. Using this acreage, the existing ecological restoration projects in the Basin reduced nutrient loads to the Basin by 1,990 pounds of nitrogen and 351 pounds of phosphorus per year. No sediment reduction calculations have been conducted for the above reported acreages.

The Restoration database had additional untracked projects, but due to insufficient information or geo-referencing, acres restored or created, and/or type of project, the reported number of projects to the Chesapeake Bay model is an underestimate. In addition, there are other types of projects, such as phragmites removal, and reconnection of ditched streams to their floodplain that are not credited or reported. During the spring of 2010 some projects were not reported because they lacked efficiency reductions within the model.

The State has not previously reported reforestation resulting from post-harvesting or afforestation of cropland to the Bay Program, but has initiated discussion on reporting these two practices. Since 2008 these practices have been tracked and geo-referenced which allows the State to calculate acres of the practice at the HUC 12 watershed level. Since 2008, there has been 900 acres (300 acres per year) of reforestation and 74 acres (25 acres per year) of reforestation with the Chesapeake Basin of Delaware.

There are still data gaps and needs for quantifying the nutrient and sediment reductions associated with other types of restoration and enhancement activities. DNREC's CWA Nonpoint Source Program is working to populate the new database to better track restoration activities and for future reporting.

10.3.2 Funding Gaps

The DELIP program conducts compliance checks in the fall of every year of projects funded by the program. Unfortunately, funding for DELIP has been eliminated from the federal budget. Therefore, funding for implementation of on-the-ground restoration is almost expended; however, Division of Fish and Wildlife continues to provide technical assistance to landowners interested in enhancing wildlife habitat for "species of greatest conservation need". DELIP practices have been tracked in the existing restoration data base, but some of the non-federal projects may not have been reported to the Chesapeake Bay Program.

Additionally, early in 2010, the State submitted an application for a National Fish and Wildlife Chesapeake Bay Innovative Nutrient and Sediment Reduction Grant. Delaware proposed a collaborative and multi-prong approach to reduce nutrient and sediment issues in the Chesapeake Bay Watershed from urban and rural nonpoint sources concentrating on three diverse tasks. The grant was to identify and prioritize urban sources and develop a registry of potential improvements for implementation, then implement up to five demonstration projects from the registry. The Nanticoke watershed has experienced significant growth. In addition, the State proposed working with private property owners, including farmers, within targeted sub-watersheds to restore riparian areas by establishing or enhancing buffers, restoring channelized ditches by reconnecting floodplains, and restoring or enhancing freshwater wetlands to reduce loads from agriculture and urban areas primarily located in the Nanticoke watershed, but not limited to that area. The pre-proposal was well received and the State was requested to submit a full proposal, however due to lack of commitment from partner communities, the project was not able to be funded.

10.4 Strategy to Fill Gaps

The interim WIP goals proposed for ecological restoration will not be met by regulatory actions alone. Nevertheless, the State will need a list of potential projects that could be chosen when either funding becomes available for ecological restoration or if there is a need for a project that will fulfill regulatory requirements. The new ecological restoration database will allow the state to track projects by geo-referencing potential projects to any watershed basin, sub-watershed or stream segment. The existing restoration data base will be transferred into the new database and any incomplete data will be added, completed or verified. In the past, agencies and non-profits doing the implementation did not consistently track the implementation projects or have the staff to manage or maintain the database. The purpose of the new restoration database must be clearly defined, as do the necessary parameters that must be entered. It will be necessary to have a commitment to track all restoration projects within the state by all agencies and non-profits that are involved in ecological restoration. The Restoration Subcommittee has talked about developing a memorandum of understanding that will formalize an agreement to track restoration projects for State and federal regulatory and non-regulatory programs.

In order to keep the database accurate and up-to-date there must be one individual responsible to oversee its development and data input. Due to the present economic conditions, sufficient funds are unavailable to hire a database manager. The State intends to rely on existing staff to address the database input and maintenance to fulfill this need in the interim.

The Restoration Subcommittee must ensure that all restoration projects are adequately tracked, all pertinent data is recorded into the restoration data base and eventually transferred to the National Environmental Information Exchange Network (NEIEN).

Finally, the State must develop a funding mechanism to consistently have non-federal funds available for grant match as well as a way to cost share on projects that will improve the health of the State's environment whether in or out of the Chesapeake basin.

10.4.1 Best Management Practices

The Restoration Subcommittee used existing geo-referenced wetlands, forestry practices, and best professional judgment to propose restoration goals to meet WIP goals. Table 44 contains the proposed interim goals for ecological restoration. The goals focus on restoration activities in the watershed that improve and maintain the ecological integrity of species and habitats and the functions and services they provide. Based upon the Nanticoke Restoration Plan, the conservation targets with the highest priority were:

1. Headwater forests
2. Large forest tracts
3. Channelized streams
4. Corridor and riparian buffers
5. Tidal wetland buffers

Thus, the proposed WIP ecological restoration goals reflect these priorities. The proposed WIP goals will be tracked at HUC 12 watersheds level. Some of these proposed goals will be achieved and financed through existing agricultural cost share programs as demonstrated in Section 9.

The Agricultural Subcommittee has established a goal to increase Streamside Forest Buffers on private lands by 223 acres to 2,449 acres for 2010-2011. To achieve this goal the Agricultural Subcommittee indicated that an additional funding of \$425/acre average for installation, \$138/acre/year land rental, \$35.60/acre/year interest, and \$5 acre/year maintenance is needed. For the 2012-2017 time period, there will be 3,564 total acres, bringing the cost of partial implementation to \$568,650 installation cost + \$1,846,440 rental + \$476,328 interest + \$66,900 maintenance = \$2, 958,3184. These cost share funds are available for the implementation of streamside buffers on private agricultural lands through the Delaware Conservation Reserve Enhancement Program and USDA's Conservation Reserve Enhancement Program. Costs are based on a 10 year contract agreement.

The Agricultural Subcommittee proposed an increase of wetland restoration on private lands by 29 acres to 315 acres for 2010-2011. Again to achieve this goal additional funding of \$1.072/acre average for installation, \$138/acre/year land rental, and \$5 acre/year maintenance is needed. For 2012-2017, there will be 460 acres of restored wetlands, bringing the cost of partial implementation to \$2,961,148 installation cost + \$240,120 rental + \$8,700 maintenance = \$3,209,968. Cost share funding to offset the costs of implementation are available for the implementation of Wetland Restoration on private agricultural lands through the Delaware Conservation Reserve Enhancement Program and USDA's Conservation Reserve Enhancement Program. Funding for wetland creation, restoration, and enhancement is also available from various federal sources, State and local government and nonprofit organizations.

The Public Lands Subcommittee proposed to construct/restore 7 acres of wetland on Public Lands. The current amount of Wetland Restoration varies by year; Delaware's goal is to increase the amount annually. Additional funding of up to \$1,702/acre is needed to achieve this goal.

As discussed in Drainage Program subsection in this Restoration Section, there exists a suite of innovative alternative practices designed to enhance the removable of nutrients once they leave the field. These include increasing vegetative buffers that protect ditches from sediment and nutrient runoff. This does include reengineering of drainage channels to reestablish floodplains or redirect storm flows to wetland areas. There are currently 17,700 linear feet of streamside/tax ditch restoration practices within the Chesapeake Bay Watershed; Delaware's goal is to expand this to 6,000 additional linear feet for 2010-2011. The Agricultural Subcommittee indicates that additional funding of \$75 per linear foot is needed to achieve the 6,000 linear feet goal. For the time period of 2012-2017, they're proposing an additional 1,250 linear feet will be implemented annually for a total of 31,200 linear feet total, bringing the cost of partial implementation to \$1,012,500. Cost share funding to offset the costs of Streamside/Tax Ditch Restoration projects is available from the State of Delaware Conservation Cost Share Program and the various Farm Bill programs. Potential funding could be provided through the Chesapeake Bay Grant and the CWA Section 319 Program. Additional sources will be pursued to allow for the increased BMP implementation schedule.

Table 44: Proposed interim restoration goals and Milestones for the Chesapeake Basin of Delaware

Conservation Target	Interim WIP Goal	Goal by 2025	Total Goal (includes existing acres on the ground and goals from the Agriculture Subcommittee)
Headwater forests (Wetland Restoration)	125 acres per year	1,875 acres	5,725 acres
Large forest tracts (Wetland Restoration)	173 acres per year	2,595 acres	
Channelized streams (Stream Restoration)	0.8 miles per year	12 miles (63,202 feet)	63,202 feet
Corridor and riparian buffers (Forest Buffers)	82 acres per year	1,230 acres	7,020 acres
Tidal Wetland Buffers (Grass Buffers)	35 acre per year	525 acres	8,297 acres
Reforestation of Erodible Crop and Pastureland*	450 acre per year	6,750 acres	NA
Afforestation* (Tree Planting)	35 acres per year	525 acres	930 acres

**The reforestation and afforestation goals were based upon actual implementation numbers from Delaware Department of Agriculture from 2008 to spring of 2010 and goals reflect achievable implementation goals for forestry practices in Chesapeake basin of Delaware.*

Additionally, the Restoration Subcommittee will investigate goals for restoration in the developed environment (Urban Forest Buffers, Urban Grass Buffers, and Urban Stream Restoration). The Delaware Forest Service completed a GIS analysis to determine the amount of existing riparian area under canopy in

each of the municipalities within the Chesapeake to infer the extent of existing forested buffers. For this analysis, the riparian area was defined as 100 feet from all streams and other water bodies, including stormwater ponds. The bullets below detail the steps taken to determine the data presented in Table 45 below:

- Create an “improved” starting point for the riparian buffer through heads-up digitization on 2007 orthos. Started with the streams layer from the DataMil (<http://datamil.delaware.gov/geonetwork/srv/en/main.home>) and corrected and added to this to include all streams, ditches, end edges of lakes, ponds, and stormwater ponds visible on the aerials. These changes were extensive.

- Buffer the resulting layer 100’ to represent riparian area available for tree cover. Open water was clipped out since that cannot be planted.

- Intersect canopy cover with the 100’ riparian buffer. Created canopy cover data for all 57 municipalities using LiDAR data from 2007 for Kent and New Castle (digitized it for Sussex) in a previous project a couple of years ago.

- Calculate % of 100’ riparian buffer area under canopy.

The data in Table 45 indicates that the extent of riparian areas varies greatly between all of the towns from as little as less than 2 acres in Hartly to as much as 512 acres in Middletown. Additionally, the portion of the riparian area already forested also varies greatly from only 4% in Hartly to 57% in Bethel. The Restoration Subcommittee will use this information while doing outreach to local governments to investigate opportunities for voluntarily increasing the forested buffers within each town.

Table 45: The amount of existing riparian area under canopy in each of the Chesapeake municipalities

<u>Town</u>	<u>Acres</u>	<u>Within 100' Riparian Buffer</u>		<u>% of Buffer Under Canopy</u>
		<u>Total Acres</u>	<u>Canopy Acres</u>	
Bethel	285.09	12.2	6.94	57%
Blades	308.96	15.29	7.51	49%
Bridgeville	2,877.83	284.79	78.15	27%
Delmar	597.89	31.37	5.52	18%
Ellendale	165.68	19.87	8.24	41%
Farmington	46.30	No streams present within municipal boundary.	N/A	N/A
Georgetown	2,965.15	324.61	111.3	34%
Greenwood	472.14	44.71	11.11	25%
Harrington	1,682.77	155.51	67.22	43%
Hartly	35.78	1.83	0.08	4%
Laurel	1,729.53	197.92	97.72	49%
Middletown	7,441.07	511.86	129.68	25%
Seaford	3,234.97	206.35	110	53%

10.4.2 Accomplishments Since Phase I

Between 2009 and 2011 a total of \$181,595 was allocated from the Chesapeake Bay Implementation Grant for restoration within the Nanticoke Watershed. As of July 31, 2011, 50 percent of the funds have been spent. There are two projects planned for 2012 - a water control structure on an agriculture operation in the Nanticoke Watershed and a rain garden at Trap Pond State Park. All other remaining funds will be carried over into the next budget period for other restoration projects. In order to be more efficient and productive, the Watershed Assessment Section will partner with the US Fish and Wildlife Service and Ducks Unlimited during future budget periods and we anticipate that this will result in funds being spent in a timely manner.

A contractor through the Kent Conservation District worked over the past several years to make contacts with landowners to determine eligible restoration and conservation projects and carried out restoration projects on state owned lands. Projects included water quality monitoring, reconnecting floodplains to stream channels, and establishment of new plant materials. This project has not utilized as much funding as originally anticipated for several reasons. First, two KCD contractors were originally planned but one left for other employment early in the budget period and the position was never refilled. Second, the projects that have occurred have been able to utilize partner resources – for example, funds that were budgeted for construction by private contractors were not necessary since Conservation District staff performed the work themselves. The Webber Wetland Restoration Project (located southwest of Smyrna within Chesapeake basin) was constructed by the Kent Conservation District with planning, design, inspection and construction layout from DNREC's Drainage Program, Ecological Restoration Program and the Kent Conservation District. The purpose of the project is to demonstrate methods to improve the water quality of surface water runoff from poultry production areas and adjacent agricultural fields. The plan involved constructing a wetland treatment system in an agricultural field approximately one acre in size.

This project is a great example of the work we've been promoting for the last few years in partnership with the Department of Agriculture and the agricultural community to improve the water quality of agricultural runoff. This project consists of constructing a 1 acre wetland with a water control structure to filter a production area with 6 poultry houses, supportive structures and 55 acres of cropland. This project complements former Tax Ditch and Wetland Restoration Projects on the Webber Farm involving 3 water control structures, 2 acres of wetlands and a diversion tile from the tax ditches into the wetland. This project is a good example of "Whole Farm Water Management"

Table 46: Chesapeake Bay Annual Accomplishments (2010 through October 2011 as tracked by Restoration Subcommittee):

Practice	Amount of Acres Installed	Acres treated	WIP Goal	Partner Agency
Wetland Restoration (657)	1	5	125 acres per year	Department of Agriculture
Reforestation of Erodible Crop and Pastureland*	375	375	450 acre per year	Department of Agriculture

Afforestation* (Tree Planting))	15	15	35 acres per year	Department of Agriculture
Headwater forests* (Wetland Restoration)	76.3	76.3	125 acres per year	US Fish and Wildlife Service
Proposed Headwater forests (Wetland Restoration) for 2012*	65.4	65.4	125 acres per year	US Fish and Wildlife Service

*Work result from Coordinator funded by Chesapeake Bay Implementation Grant

10.5 Tracking and Reporting Protocols

Tracking and assessment of restoration BMP implementation data is necessary to fully reflect impacts from on-the-ground activities that reduce nutrient and sediment pollution. Work is underway to first modify the existing database to be more complete and comprehensive. This data will then be transferred to the National Environmental Information Exchange Network (NEIEN) schema so that data may be directly sent to the Chesapeake Bay Program through network nodes and receive credit in the model. A description of data generation and acquisition, assessment and oversight, and data validation and usability will be provided in Delaware's Nonpoint Source Best Management Practice Implementation Data Quality Assurance Project Plan (Appendix C). DNREC staff is also participating in the development of the Bay TMDL Accounting and Tracking System (BayTAS) Version 1.0 to track the TMDL waste load allocations and Delaware's progress toward meeting those goals.

10.6 Sea Level Rise Considerations

Sea level rise is expected to have significant impacts on Delaware's tidal and nontidal wetlands as well as riparian areas, and forests. Some types of wetlands, such as saltwater tidal wetlands (marshes), may experience close to complete inundation under even the 0.5 meter scenario. Nontidal wetlands, which are often forested, may also be stressed as they currently have fewer regulatory protections and experience pressure from agriculture and development conversions (Table 47).

Table 47: Acres of Wetlands within Potential Sea Level Rise Inundation Areas

	0.5 Meter Scenario	1.0 Meter Scenario	1.5 Meter Scenario
Non-tidal Wetlands	282.52	443.24	689.35
Tidal Wetlands	645.40	695.90	815.35
Total	927.92	1,139.14	1,504.69

The overall impact on each wetland depends on the local sediment supply and its' ability to naturally migrate inland. If wetlands are not allowed to naturally migrate and are lost, the services they provide may be lost. These ecosystem services include: flood mitigation, carbon sequestration, habitat to many plant and animal species, and most importantly for the purposes of this WIP, pollutant filtering and retention. As salinity and hydrology changes occur, natural areas may see a change in species composition and diversity. Wetlands are also part of estuarine systems which are critical to fisheries and shellfisheries and these industries may suffer. Likewise, tourism and recreation may be impacted by a loss of wetlands.

Providing a riparian corridor around wetlands provides an initial area for migration so buffers remain a crucial BMP for water quality. Since Delaware's WIP relies heavily on implementing wetland restoration projects, forested and grass buffers, and tree planting by 2025 and maintaining these acres into the future, their placement and potential longevity should be considered so that those investments are protected and allow for natural migration as sea levels rise. The National Oceanic and Atmospheric Administration (NOAA) released a Workshop Report that can be used as a reference in future wetland restoration projects: "Planning for Sea Level Rise in the Northeast: Considerations for the Implementation of Tidal Wetland Habitat Restoration Projects." The long-term success of the water quality strategies outlined within this document relies heavily on the natural functions of wetlands and buffers and these tools can also be used to prepare for potential sea level rise as well.

SECTION 11. PUBLIC LANDS

Through the Executive Order for the Chesapeake Bay, the federal government is going to lead by example and change land management practices and increase implementation on federally owned lands throughout the Chesapeake. The Public Lands Subcommittee has the goal of doing the same with publicly owned lands, beginning with State-owned lands, in Delaware's portion of the Chesapeake. The Public Lands Subcommittee is made up of members from DNREC's Land Preservation Office, Environmental Stewardship Program, Watershed Assessment Section, and Wildlife Administrators and Regional Managers from the Division of Fish and Wildlife. Additionally, there are also representatives from the Department of Agriculture and their State Forestry Program, and DelDOT on the Subcommittee. As this WIP is implemented over time, the Subcommittee will reach out to other public land owners, whether they be other state agencies (schools, etc.), county or local governments, or potentially even nonprofit agencies.

11.1 Currents Programs and Capacities

Most of the public lands owned within the Chesapeake Bay watershed are managed by two state departments: Department of Natural Resources and Environmental Control (Division of Fish and Wildlife; Division of Parks and Recreation) and Delaware Department of Agriculture (Delaware Forest Service; Figures 41 and 42). These agencies manage land for fish and wildlife habitat, water quality, recreational opportunities, forest resources, ecosystem services, demonstration areas, cultural resource protection, environmental education, and for the conservation of open space. Not all of the lands are open to the public; some are closed to protect specific resources. Additionally, some of these public lands are leased for agricultural purposes.

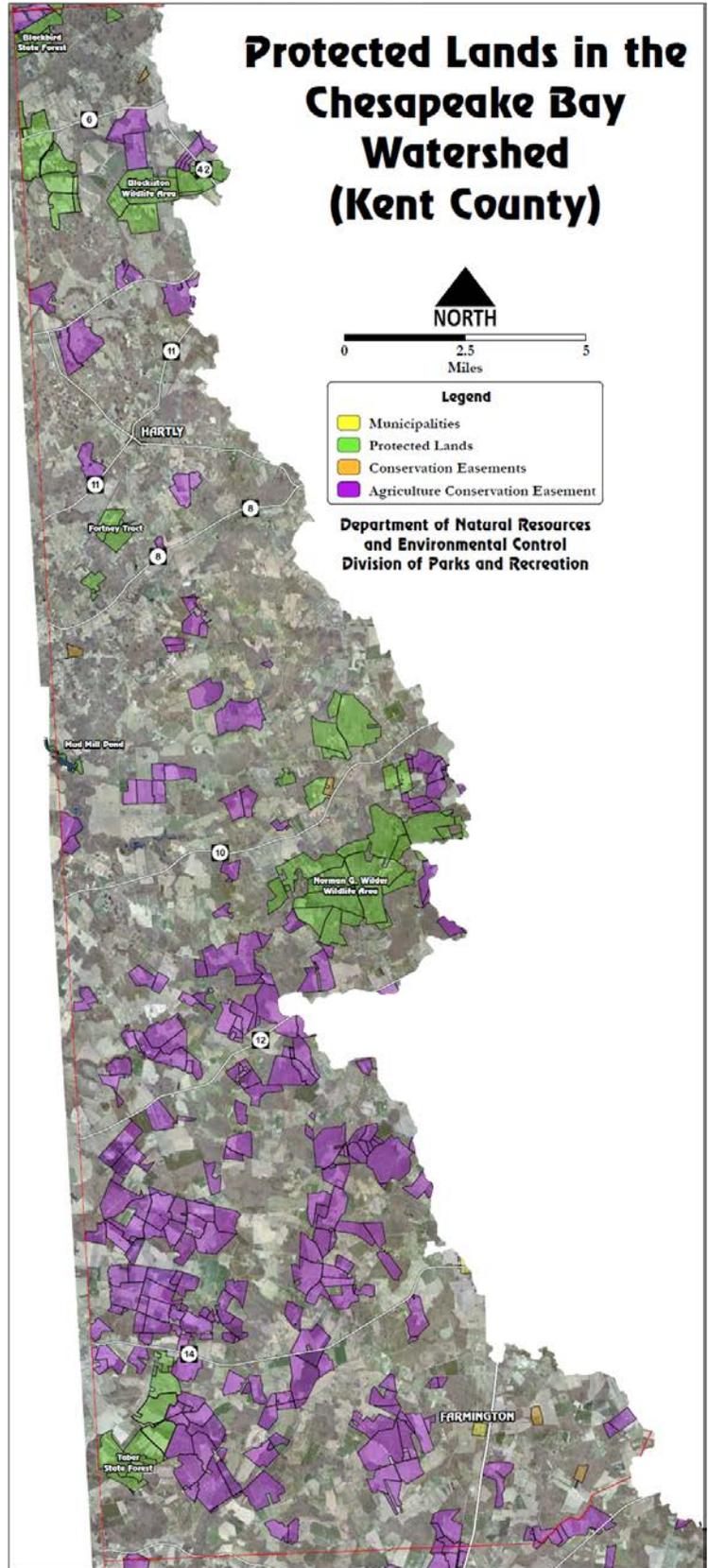
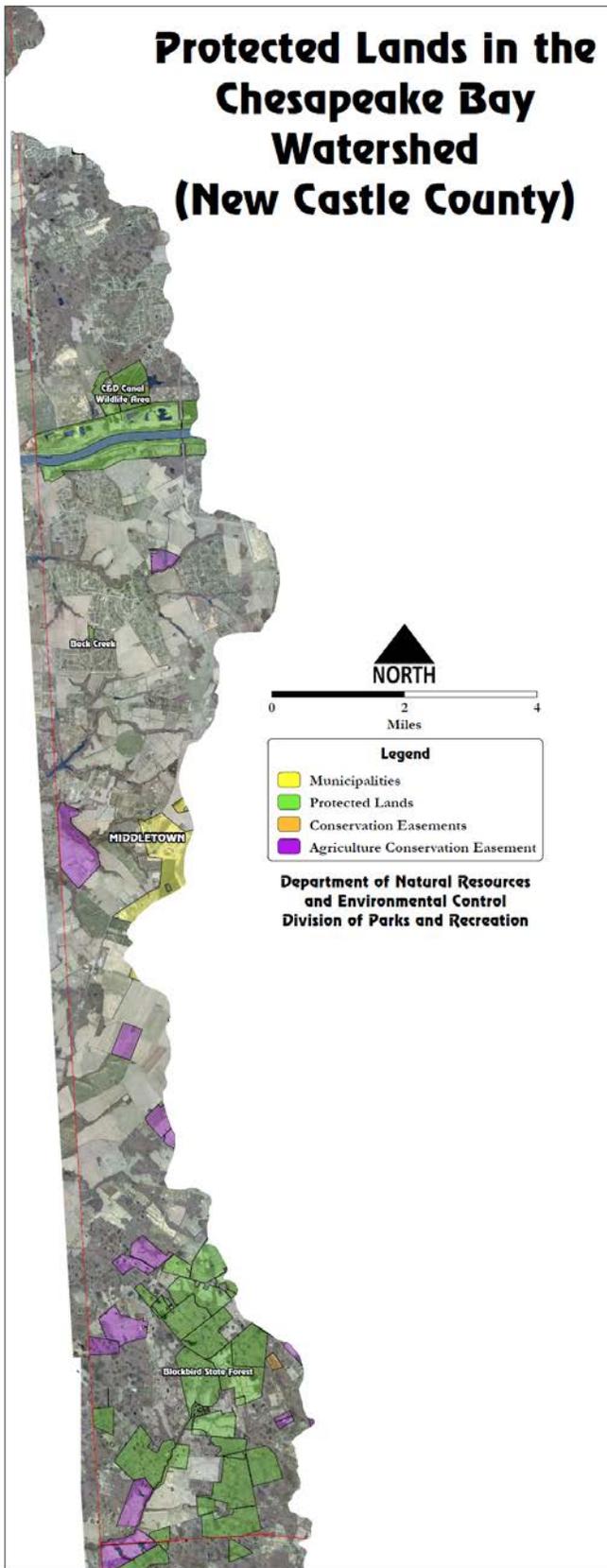


Figure 41: Protected lands in the Chesapeake Bay Watershed of New Castle County and Kent County

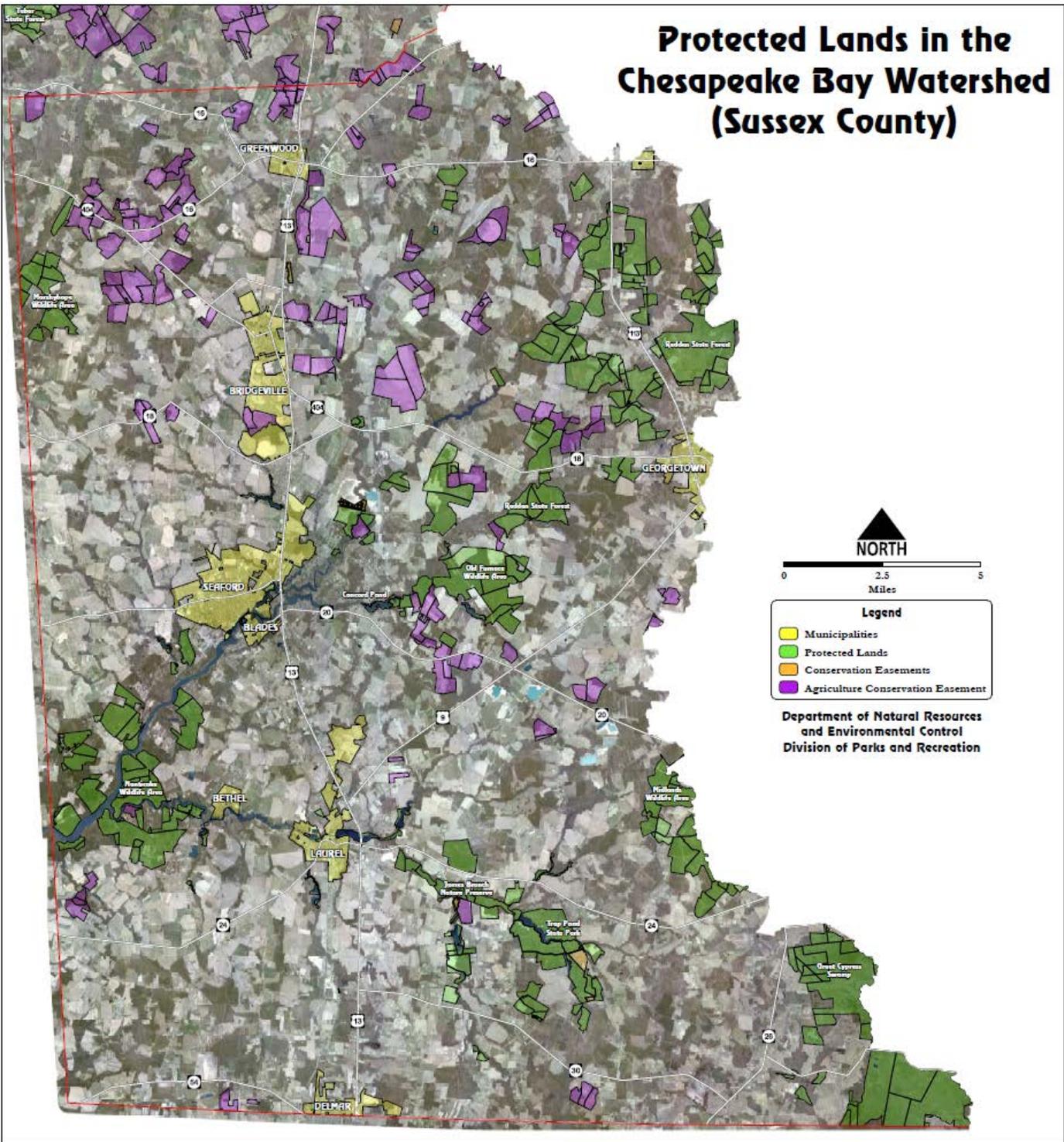


Figure 42: Protected lands in the Chesapeake Bay Watershed of Sussex County

11.1.1 DNREC Division of Fish and Wildlife

11.1.1.1 Program Overview and Capacity

The Division of Fish and Wildlife (F&W) manages over 20,000 acres in the watershed, including 7 wildlife areas and 10 millponds. Land use and land characteristics vary region to region. In New Castle County the Division administers the federal Chesapeake & Delaware Canal lands for hunting, dog training, hiking, and biking. The area was created with the dredging of the Canal resulting in a terraced, mainly open, non-forested landscape. In Kent County the Division has 2 wildlife areas and a public millpond. These sites contain headwater forests and streams, mixed hardwood forest blocks, farmland, and ditched waterways and are primarily managed for hunting and general wildlife habitat. In Sussex County the Division has 4 wildlife areas and 9 public millponds. These sites contain headwater forests and streams, mixed hardwood forest blocks, former pine plantation forests, natural and channelized riparian corridors, forested riverine systems, farmland, and ditched waterways. These lands are managed for hunting, fishing, general wildlife habitat, rare plant and animal protection, unique natural communities, and agriculture.

11.1.1.2 Tracking and Reporting Protocols

BMPs occurring on agricultural lands owned by F&W has been collected and reviewed by DNREC. Currently, out of 1505 acres of agricultural lands owned by F&W, 1234 acres have at least 10 foot buffers around the edge and along ditches and at least 477 acres keep crop residues on the field for wildlife after harvest and no tillage can occur until March. Farmers always have the option to plant cover crops and many do, but they are not required. By 2013, DNREC is planning to require cover crops on all agricultural fields. DNREC is in the process of developing a working group to establish standards and lease provisions.

A BMP tracking database for public lands managed by DNREC and DDA will be established and populated by the end of 2012. This will be expanded to other public lands after completing these two departments. Data maintained external to the departments will be incorporated into the new system. This data will then be extracted into the National Environmental Information Exchange Network (NEIEN) schema so that data may be directly sent to the Chesapeake Bay Program through network nodes and receive credit in the model. A description of data generation and acquisition, assessment and oversight, and data validation and usability will be provided in Delaware's Nonpoint Source Best Management Practice Implementation Data Quality Assurance Project Plan (Appendix C). DNREC staff is also participating in the development of the Bay TMDL Accounting and Tracking System (BayTAS) Version 1.0 to track the TMDL waste load allocations and load allocations and Delaware's progress toward meeting those goals.

11.1.1.3 Gap Analysis

Funding may be critical as it relates to various aspects of BMP implementation on public lands. If major retrofits of significant features such as stormwater facilities are required, current budgets will not cover such expenditures. The current administration has prioritized parcels in the Nanticoke River watershed for acquisition with FY2012 Open Space funds. The land preservation specialist for F&W has come up with priority acquisition areas around wildlife areas in the watershed that would protect critical wildlife habitat, benefit water quality and provide for recreation.

Technical assistance will be necessary to critically analyze on-the-ground management activities in relation to the Watershed Implementation Plan goals for properties already owned by F&W as well as properties targeted for acquisition. The utilization of the expertise of the land managers who are most familiar with the properties will be needed to show the feasibility of revising current land use activities. Additionally, funding and other support means will be crucial to implementing any needed actions.

11.1.1.4 Strategies to Fill Gaps

All of the public lands managed by the agencies noted above, as well as other public lands, such as schools, DelDOT sites, county and municipal parks, and federal lands, should lead by example in the area of water quality protection and enhancement in the watershed. In order to achieve this, the Public Lands Subcommittee will work with public land managers and other subcommittee members to provide the following information from F&W:

- Existing best management practices (BMPs) on public lands has been reviewed by the committee
- It has been determined that it could be feasible to require cover crops for all F&W owned agricultural lands.
- Analyze reforestation/afforestation opportunities for currently owned and targeted properties
- Review tax ditch management
- Review effectiveness of stormwater facilities
- Review Tributary Action Teams recommendations for consistency

DNREC and DDA manage over 38,000 acres in the watershed. Of this amount 3,000 acres are in farmland. During calendar year 2011, these agencies, working through the Public Lands Subcommittee analyzed this acreage for the above-listed information and suggestions were made to the appropriate parties regarding State owned agricultural fields. In calendar year 2012, the remaining bulleted points will be more closely examined and suggestions for improvement will be made to the appropriate parties.

11.1.1.5 Contingencies

Suggested actions for F&W properties in the watershed is to require cover crops and buffers for any agricultural lands when the leases expire and they go out for bid again.

11.1.2 DNREC Division of Parks and Recreation

11.1.2.1 Program Overview and Capacity

The Division of Parks and Recreation (Parks) manages over 3,300 acres of land and 4 millponds at Trap Pond State Park, the James Branch Nature Preserve and the Nanticoke River Nature Preserve, all in Sussex County. Trap Pond State Park contains pine-hardwood forest blocks, former pine plantations, bald cypress wetlands and stream corridors, headwater forests and streams, farmland, and ditched waterways. It also has a campground, nature center, hiking and biking trails, and canoeing/kayaking options. The James Branch Nature Preserve protects headwater forests and streams and bald cypress riparian corridors containing rare plants and animals and unique natural communities. The Nanticoke River Nature Preserve protects a small hardwood forest and Atlantic white cedar wetlands and has a hiking trail.

11.1.2.2 Tracking and Reporting Protocols

BMPs occurring on agricultural lands owned by Parks has been collected and reviewed by DNREC. Parks owns 18 agricultural fields in the Nanticoke River Watershed, all of which surround Trap Pond State Park. All farmers who hold the agriculture leases on Parks owned fields are required to have nutrient management plans, as required by State law, and 11 of those fields have conservation plans in place as well. Out of these 383.16 acres of agricultural lands owned by Parks, 161.24 acres currently use cover crops as part of their conservation plan. By 2013, DNREC is planning to require cover crops on all agricultural fields. DNREC is in the process of developing a working group to establish standards and lease provisions.

A BMP tracking database for public lands managed by DNREC and DDA will be established and populated by the end of 2012. This will be expanded to other public lands after completing these two departments. Data maintained external to the departments will be incorporated into the new system. This data will then be extracted into the National Environmental Information Exchange Network (NEIEN) schema so that data may be directly sent to the Chesapeake Bay Program through network nodes and receive credit in the model. A description of data generation and acquisition, assessment and oversight, and data validation and usability will be provided in Delaware's Nonpoint Source Best Management Practice Implementation Data Quality Assurance Project Plan (Appendix C). DNREC staff is also participating in the development of the Bay TMDL Accounting and Tracking System (BayTAS) Version 1.0 to track the TMDL waste load allocations and load allocations and Delaware's progress toward meeting those goals.

11.1.2.3 Gap Analysis

Funding may be critical as it relates to various aspects of BMP implementation on public lands. If major retrofits of significant features such as stormwater facilities are required, current budgets will not cover such expenditures. The current administration has prioritized parcels in the Nanticoke River watershed for acquisition with FY2012 Open Space funds. The land preservation specialist for Parks has come up with priority acquisition areas around Trap Pond State Park which would protect critical wildlife habitat, benefit water quality and provide for recreation.

Technical assistance will be necessary to critically analyze on-the-ground management activities in relation to the Watershed Implementation Plan goals for properties already owned by Parks as well as properties targeted for acquisition. The utilization of the expertise of the land managers will be needed to show the feasibility of revising current land use activities. Additionally, funding and other support means will be crucial to implementing any needed actions.

11.1.2.4 Strategies to Fill Gaps

All of the public lands managed by the agencies noted above, as well as other public lands, such as schools, DelDOT sites, county and municipal parks, and federal lands, should lead by example in the area of water quality protection and enhancement in the watershed. In order to achieve this, the Public Lands Subcommittee will work with public land managers and other subcommittee members to provide the following information:

- Existing best management practices (BMPs) on public lands has been reviewed by the committee

- It has been determined that it could be feasible to require cover crops for all Parks owned agricultural lands
- Verify compliance with authorized BMPs
- Analyze reforestation/afforestation opportunities for currently owned and targeted properties
- Review tax ditch management
- Review effectiveness of stormwater facilities
- Review Tributary Action Teams recommendations for consistency

DNREC and DDA manage over 38,000 acres in the watershed. Of this amount 3,000 acres are in farmland. During calendar year 2011, these agencies, working through the Public Lands Subcommittee analyzed this acreage for the above-listed information and suggestions were made to the appropriate parties regarding State owned agricultural fields. In calendar year 2012, the remaining bulleted points will be more closely examined and suggestions for improvement will be made to the appropriate parties.

11.1.2.5 Contingencies

Suggested actions for P&R properties in the watershed is to require cover crops and buffers for any agricultural lands when the leases expire and they go out for bid again.

11.1.3 Delaware Forest Service

11.1.3.1 Program Overview and Capacity

The Delaware Forest Service in the Department of Agriculture manages over 14,000 acres of state-owned land containing all or part of 3 state forests. Each of the forests is maintained for long-term forest management which includes varying harvesting regimes and demonstration sites. Blackbird State Forest, almost entirely in New Castle County, contains mixed hardwood forests, coastal plain ponds, and headwater forests and streams. It also has an environmental education center and provides hunting, hiking and primitive camping opportunities. Taber State Forest in Kent County is mixed pine-hardwood forestland, farmland, and ditched waterways and provides hunting areas. Redden State Forest in Sussex County has headwater forests and streams, pine and hardwood forest blocks, former pine plantation forests, farmland, and ditched waterways. An environmental education center and overnight lodge accommodations are available, as well as hunting and hiking opportunities.

11.1.3.2 Tracking and Reporting Protocols

BMPs occurring on lands owned by DDA has been collected and reviewed by the subcommittee. Blackbird State Forest has 74 acres of BMP projects, 38 of which received CREP funding. These projects include the establishment of filterstrips of cool season grasses, the planting of warm season grasses for wildlife, hardwood afforestation and wetland restoration. In Redden State Forest, there has been 55.55 acres of BMP projects, none of which received CREP funding that included creating shallow water wildlife points, pine afforestation, coastal plain pond restoration and floodplain restoration. In Taber State Forest there has been 122.75 acres of BMP projects, 114.8 of which has received CREP funding. These projects included filterstrips of cool season grasses, planting warm season grasses for wildlife habitat, hardwood and pine afforestation, shallow wetland restoration and shrub and tree planting.

A new policy has been put in place to require cover crops on DDA leased agriculture lands. As leases come up for renewal or go out to be rebid, cover crops will be required. All DDA leased agriculture lands will require cover crops by January 1, 2015. Currently, agricultural buffers are encouraged, but not required.

A BMP tracking database for public lands managed by DNREC and DDA will be established and populated over the end of 2012. This will be expanded to other public lands after completing these two departments. Data maintained external to the departments will be incorporated into the new system. This data will then be extracted into the National Environmental Information Exchange Network (NEIEN) schema so that data may be directly sent to the Chesapeake Bay Program through network nodes and receive credit in the model. A description of data generation and acquisition, assessment and oversight, and data validation and usability will be provided in Delaware's Nonpoint Source Best Management Practice Implementation Data Quality Assurance Project Plan (Appendix C). DNREC staff is also participating in the development of the Bay TMDL Accounting and Tracking System (BayTAS) Version 1.0 to track the TMDL waste load allocations and load allocations and Delaware's progress toward meeting those goals.

11.1.3.3 Gap Analysis

Funding may be critical as it relates to various aspects of BMP implementation on public lands. If major retrofits of significant features such as stormwater facilities are required, current budgets will not cover such expenditures.

Technical assistance will be necessary to critically analyze on-the-ground management activities in relation to the Watershed Implementation Plan goals. The utilization of the expertise of the land managers will be needed to show the feasibility of revising current land use activities. This outreach would extend beyond just state wildlife areas, parks and forests. Additionally, funding and other support means will be crucial to implementing any needed actions.

11.1.3.4 Strategies to Fill Gaps

All of the public lands managed by the agencies noted above, as well as other public lands, such as schools, DelDOT sites, county and municipal parks, and federal lands, should lead by example in the area of water quality protection and enhancement in the watershed. In order to achieve this, the Public Lands Subcommittee will work with public land managers and other subcommittee members to provide the following information:

- Existing best management practices (BMPs) on public lands has been reviewed
- Determine potential for increased/new BMPs including requiring buffers on lands that have agricultural leases
- Verify compliance with authorized BMPs
- Analyze reforestation/afforestation opportunities
- Review tax ditch management
- Review effectiveness of stormwater facilities
- Review Tributary Action Teams recommendations for consistency

DNREC and DDA manage over 38,000 acres in the watershed. Of this amount 3,000 acres are in farmland. During calendar year 2011, these agencies, working through the Public Lands Subcommittee,

analyzed this acreage for the above-listed information. DDA determined that 99.5 acres of BMP projects in the watershed did not receive CREP funding and are now requiring cover crops on their lands that have agriculture leases.

11.1.3.5 Contingencies

In 2012, DDA will consider whether to require buffers on lands that have agricultural leases.

11.1.4 Federal Lands

Around 8% of the entire Chesapeake Bay watershed is made up of federal lands. According to EPA, there are two federally owned parcels in the Chesapeake Bay Watershed in Delaware. They are both Army National Guard properties (Figure 43); the Seaford Readiness Center (10A65) is roughly 11.19 acres and the Pigman Armory (10A90) is 3.02 acres (Figure 44). The following information on the federal facilities was provided to DNREC from the Army National Guard, who is working with the Army Corps of Engineers:

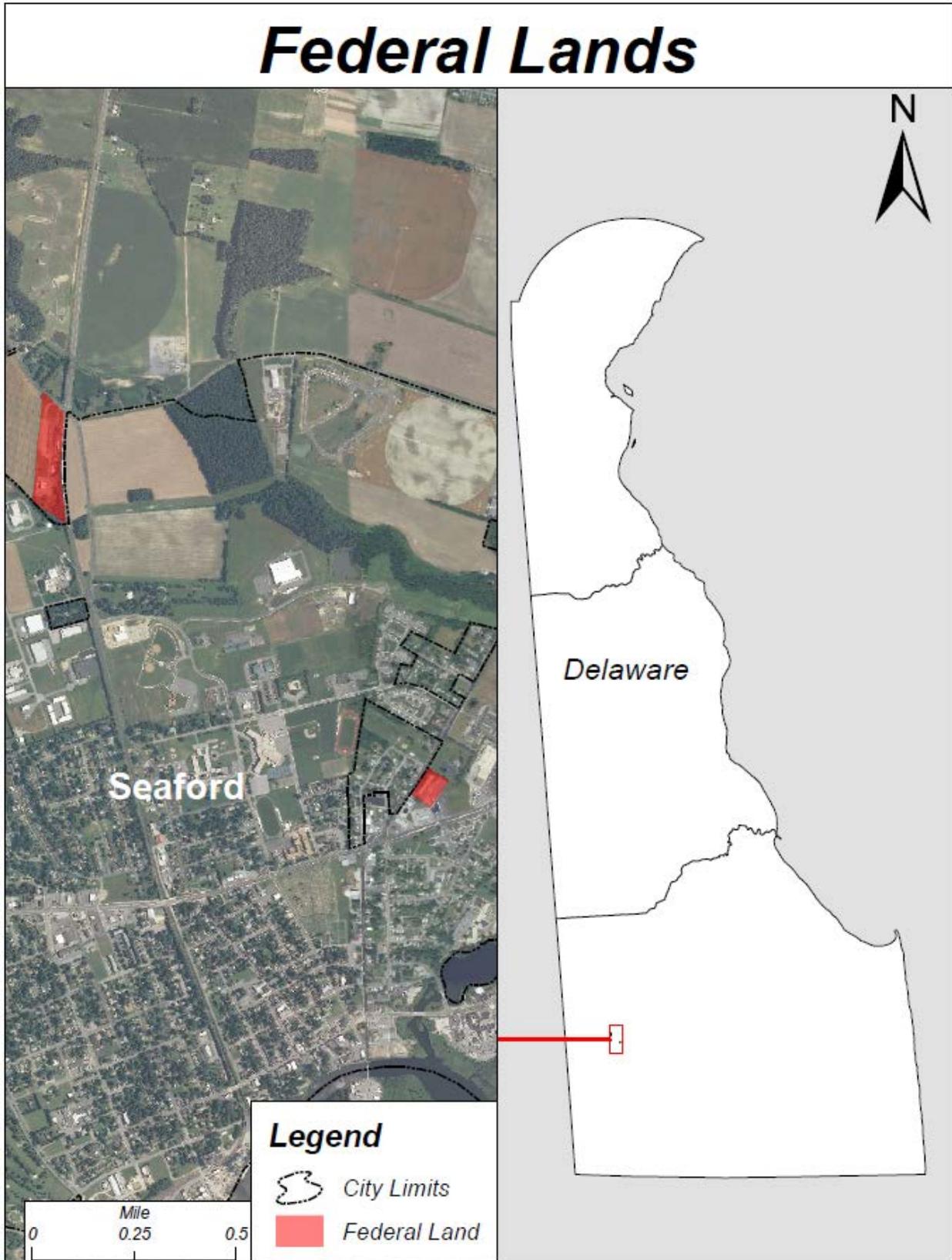


Figure 43: Federal lands in Delaware's Chesapeake Basin

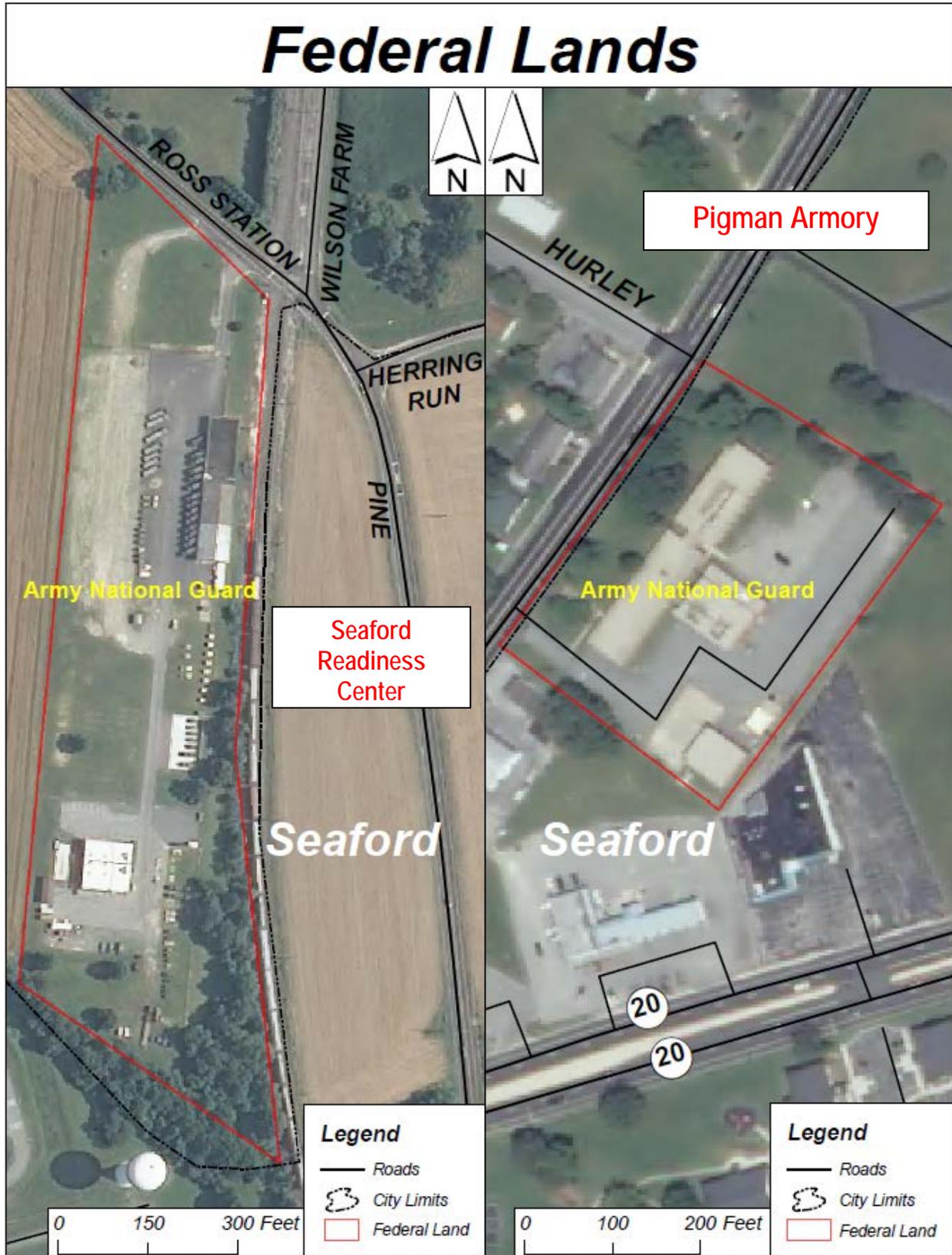


Figure 44: Two Army National Guard properties in Delaware's Chesapeake Basin.

11.1.4.1 Pigman Armory (10A90)

I. Pigman Army National Guard Armory

Pigman Armory (10A90) is located in the City of Seaford, Sussex County, Delaware. The 3.02 acre facility is located northeast of the intersection of Bridgeville Highway and Norman Eskridge Highway. There is no existing stormwater infrastructure (inlets, pipes, best management practices (BMPs)) at this location. All runoff from the site flows overland off-site and into the City of Seaford stormwater system.

Based upon field reconnaissance, 64-percent of the 3.02 acre site (1.94 acres) is categorized as high intensity impervious urban land cover. This includes building rooftops, parking areas, and sidewalks. 36-percent of the site (1.08 acres) is categorized as high intensity pervious urban land cover, or lawns.

II. Pigman Armory Baseline Loadings December 2011:

To be determined. See Section IV for more detail.

III. Programmatic Two Year Milestones 2012-2013:

- ❖ **Agricultural-** Not Applicable.
- ❖ **Stormwater Management Retrofits-** There are no existing stormwater BMPs at this site based upon field reconnaissance. Retrofit opportunities will be determined after baseline loadings are established. These results will be incorporated into our next round of two year milestones.
- ❖ **Septic System Upgrades-** Not Applicable.
- ❖ **Wastewater Treatment Plant Data-** Not Applicable.
- ❖ **Accounting for Future Growth**
 - The Pigman Armory will continue to support Delaware Department of Natural Resources and Environmental Control (DNREC) Watershed Implementation Plan (WIP) Phase II processes in 2012 and 2013.
 - The Pigman Armory will continue to implement the Army Policy for Sustainable Design and Development (SDD), October 2010 and Low Impact Development (LID) under the Energy Independence and Security Act of 2007 (EISA) as a means to manage stormwater for all future construction and maintenance projects. Currently there are no new construction projects scheduled through 2018.

IV. Successes:

The WIP Phase II process required collaborative involvement from DNREC, the Pigman Armory and the U.S. Army Corps of Engineers to ensure pollutant load reductions as well as current and future BMP implementation levels fulfill the federal share of the needed reductions for Nitrogen, Phosphorous and Sediment pollutants. In an effort to meet WIP Phase II timelines, two year milestones and critical progress milestones in 2017 and 2020, Pigman Armory successfully conducted a comprehensive assessment of boundary data and land use/land cover data on the facility to ensure data is accurate.

The federal-state-local partnership between DNREC and the Services will prove to be instrumental in meeting the long term restoration plan for the Chesapeake Bay as well as improve credibility and accountability for Department of Defense (DoD), a Federal agency leading by example.

V. Challenges:

Coordination with multiple Bay jurisdictions made it difficult to apply one agency approach to meeting the required load reductions. For the Services this required additional resources in order to understand what

each jurisdiction's expectations are, and these inconsistencies may result in long term load inaccuracies when determining whether TMDL goals have been met across the watershed.

Due to the small size of the Pigman Armory it was critical that all boundary and land use cover be verified. Facilities of this size have limited GIS data. Therefore, it took an additional amount of resources and technical capability to create shapefiles in order to verify boundaries and land use data.

VI. Inaccuracies:

There were no inaccuracies identified between the actual facility acreage and the acreage being used by EPA. The land cover data utilized by EPA is inaccurate as there are no Agriculture areas at the Pigman Armory. Land cover data that is specific to Pigman Armory is essential for accurate loading and allocations. Based upon field reconnaissance, 64-percent of the 3.02 acre site (1.94 acres) is categorized as high intensity impervious urban land cover.

It is National Guard Bureau Legal Counsel's (NGB-JA) view that the Pigman Armory is not subject to EO 13508 as it is not located on federal lands.

Reduction Targets

DNREC has suggested that once the baseline loadings have been determined that the federal facility reduction targets be equivalent to the statewide reduction targets: 24% for TN, 20% for TP, and 0% for TSS.

11.1.4.2 Seaford Readiness Center (10A65)

I. Seaford Readiness Center

The Seaford Readiness Center (10A65) is located just outside the corporate limits of the City of Seaford in Sussex County, Delaware. The 11.19 acre facility is located southwest of the intersection of Ross Station Road and Conrail Road within the Herring Run watershed, a tributary of Nanticoke River. There is no existing stormwater infrastructure (inlets, pipes, best management practices (BMPs)) at this location. All runoff from the site flows overland off-site and into the City of Seaford and/or Sussex County stormwater system. Based upon field reconnaissance, 24-percent of the 11.19 acre site (2.69 acres) is categorized as low intensity impervious urban land cover. This includes building rooftops, roads, parking areas, and sidewalks. 62-percent of the site (6.89 acres) is categorized as low intensity pervious urban land cover, which includes lawns, shrubs, and gravel areas. The remaining 14-percent of the site (1.61 acres) is forested.

DEARNG intends to demolish the main building and the current plan is to return the property back to the State of Delaware's inventory.

II. Seaford Readiness Center Baseline Loadings December 2011: To be determined. See Section VI for more detail.

III. Programmatic Two Year Milestones 2012-2013:

- ❖ **Agricultural-** Not Applicable.
 - ❖ **Stormwater Management Retrofits-** There are no existing stormwater BMPs at this site based upon field reconnaissance. Retrofit opportunities will be determined after baseline loadings are established. These results will be incorporated into our next round of two year milestones.
 - ❖ **Septic System Upgrades-** Not Applicable.
 - ❖ **Wastewater Treatment Plant Data-** Not Applicable.
 - ❖ **Accounting for Future Growth**
- The Seaford Readiness Center will continue to support Delaware Department of Natural Resources and Environmental Control (DNREC) Watershed Implementation Plan (WIP) Phase II processes in 2012 and 2013.
 - The Seaford Readiness Center will continue to implement the Army Policy for Sustainable Design and Development (SDD), October 2010 and Low Impact Development (LID) under the Energy Independence and Security Act of 2007 (EISA) as a means to manage stormwater for all future construction and maintenance projects. Currently there are no new construction projects scheduled through 2018.

IV. Successes:

The WIP Phase II process required collaborative involvement from DNREC, the Seaford Readiness Center and the U.S. Army Corps of Engineers to ensure pollutant load reductions as well as current and future BMP implementation levels fulfill the federal share of the needed reductions for Nitrogen, Phosphorous and Sediment pollutants. In an effort to meet WIP Phase II timelines, two year milestones and critical progress milestones in 2017 and 2020, the Seaford Readiness Center successfully conducted a comprehensive assessment of boundary data and land use/land cover data on the facility to ensure data is accurate. The federal-state-local partnership between DNREC and the Services will prove to be instrumental in meeting the long term restoration plan for the Chesapeake Bay as well as improve credibility and accountability for Department of Defense (DoD), a Federal agency leading by example.

V. Challenges:

Coordination with multiple Bay jurisdictions made it difficult to apply one agency approach to meeting the required load reductions. For the Services this required additional resources in order to understand what each jurisdiction's expectations are, and these inconsistencies may result in long term load inaccuracies when determining whether TMDL goals have been met across the watershed.

Due to the small size of the Seaford Readiness Center it was critical that all boundary and land use cover be verified. Facilities of this size have limited GIS data. Therefore, it took an additional amount of resources and technical capability to create shapefiles in order to verify boundaries and land use data.

VI. Inaccuracies:

There were no inaccuracies identified between the actual facility acreage and the acreage being used by EPA.

The land cover data utilized by EPA is inaccurate as there are no Agriculture areas at the Seaford Readiness Center. Land cover data that is specific to the Seaford Readiness Center is essential for accurate loading and allocations. Based upon field reconnaissance, 24-percent of the 11.19 acre site (2.69 acres) is categorized as low intensity impervious urban land cover. This includes building rooftops, roads,

parking areas, and sidewalks. 62- percent of the site (6.89 acres) is categorized as low intensity pervious urban land cover, which includes lawns, shrubs, and gravel areas. The remaining 14-percent of the site (1.61 acres) is forested.

It is National Guard Bureau Legal Counsel's (NGB-JA) view that the Seaford Readiness Center is not subject to EO 13508 as it is not located on federal land.

Reduction Targets

DNREC has suggested that once the baseline loadings have been determined that the federal facility reduction targets be equivalent to the statewide reduction targets: 24% for TN, 20% for TP, and 0% for TSS.

11.1.4.3 Federal Actions – Nanticoke Dredging

Dredging operations in the Nanticoke River have historically been conducted by the Baltimore District of the U. S. Army Corps of Engineers. The authorized federal project begins in Tangier Sound across the Maryland/Virginia border near Sharptown, Maryland, and extends upstream to Seaford, Delaware. The project also includes the Northwest Fork (Branch) channel, which begins at Upper Browns Ferry and continues to Federalsburg, Maryland. The project provides for a channel 12 feet deep and 100 feet wide from Tangier Sound to the highway bridge in Seaford, with a turning basin at the upper end and a slight widening of the channel between the bridges in the harbor at Seaford to a depth of 9 feet. The length of the sections of channel included in recent maintenance dredging projects is about 4 miles, extending over 32 miles of the river. These sections have all been located between the Delaware/Maryland State line and Seaford. (The Northwest Fork channel is 6 feet deep and 60 feet wide from Upper Browns Wharf to the southern boundary of Federalsburg, Maryland. Approximately 4 miles over the 12 mile reach of this section of the project have been dredged during maintenance episodes over the years). The last maintenance dredging of the river was in 1990 and involved the Delaware sections. The project is important to the local economy due to the abundance of commercial shipping that takes place in Seaford as well as in waterfront communities downstream along the river.

The currently proposed work consists of hydraulically dredging approximately 2.5 miles of the upper Nanticoke River near Seaford, Delaware, to its authorized depth of 12 feet (MLLW) and a width of 100 feet. The project will begin near the Woodland Ferry and extend upstream to Seaford. The turning basin in Seaford is not part of this project. A small section of channel downstream near the State line (area known as Hawk's Neck Shoal) may also be included in the work. Approximately 86,000 cubic yards of material (combination of sand, silt, clay and shell) will be dredged from the channel as part of this project. Excavated material will be pumped via pipeline to an upland confined storage facility that will be constructed on 21 (+/-) acres of the former Woodland Park Golf Course. The site is owned by Sussex County. As the local sponsor, the County is responsible for locating and providing the necessary dredged material storage facility for the project. This has also been the case during previous maintenance dredging projects in the river. The project is expected to begin once local and State permit approvals have been obtained and funding has been secured.

DNREC has performed a review of the sediment and water quality data collected by the Corps in conjunction with the proposed Nanticoke dredging project. Comments were submitted to the Corps and the Corps is in the process of addressing those comments as part of the permit application process

(e.g., subaqueous lands permit, 401 water quality certification, and coastal zone consistency). DNREC has answered any and all technical questions that the Corps has posed as they work through their analysis.

11.2 Accounting for Growth

As growth occurs in the Chesapeake, there may be opportunities to either increase the acreage of publicly owned lands or the level of BMP implementation on these lands through offset programs. The Public Lands Subcommittee will coordinate with acquisition and protection programs to help direct land use through targeted fee simple purchases and conservation easements.

11.3 Sea Level Rise Considerations

Some of the State owned lands, as well as locally owned public lands and nonprofit owned lands, fall within the sea level rise scenarios and these properties should be assessed for their ability to adapt to future conditions (Table 48). Agricultural lands may be lost as wetlands migrate inward. Natural areas may experience changes in salinity and hydrologic regime which may impact the plant and animal species present. Many of the publicly and nonprofit owned lands provide recreational opportunities and their ability to perform these functions may also be impacted by potential sea level rise.

Table 48: Acres of Publicly Owned Lands within Potential Sea Level Rise Inundation Areas

Publicly Owned Lands	0.5 Meter Scenario	1.0 Meter Scenario	1.5 Meter Scenario
Barnes Woods	0.76	1.41	2.06
Blades Marina	1.68	5.96	6.15
C&D Canal Wildlife Area	2.56	9.41	25.87
Concord Pond & Access Site	2.80	2.86	2.88
Craigs Pond & Access Site	3.14	3.77	4.17
Laurel Broad Creek	0.09	0.46	0.51
Laurel River Park	1.43	4.49	5.00
Nanticoke - Middleford North	43.44	56.68	82.06
Nanticoke River Watershed Conservancy	4.41	7.45	10.25
Nanticoke Wildlife Area	142.98	256.70	406.51
Portsville Pond & Access Site	0.40	0.83	17.10
Records Pond & Access Site	0.47	0.73	0.95
Riverview Park	0.08	0.37	0.87
Ruth Tract	3.25	4.15	9.52
Seaford Boat Ramp	0.14	0.62	1.36
Seaford Canoe Launch	0.17	0.28	0.35
Seaford Riverwalk	0.03	0.38	0.64
Soroptimist Park	-	-	0.03
Town of Blades	3.77	3.77	3.77
Williams Pond Park	-	-	0.06
Total	211.60	360.30	580.10

SECTION 12. AIR

EPA has identified atmospheric deposition of nitrogen as a major contributing source to the Chesapeake Bay watershed and will be allocating an allowable loading of nitrogen from air deposition in the Chesapeake Bay TMDL. The nitrogen loadings come from many jurisdictions in general proximity to the Chesapeake Bay watershed. Figure 45 shows the approximate delineation of the Bay airshed.

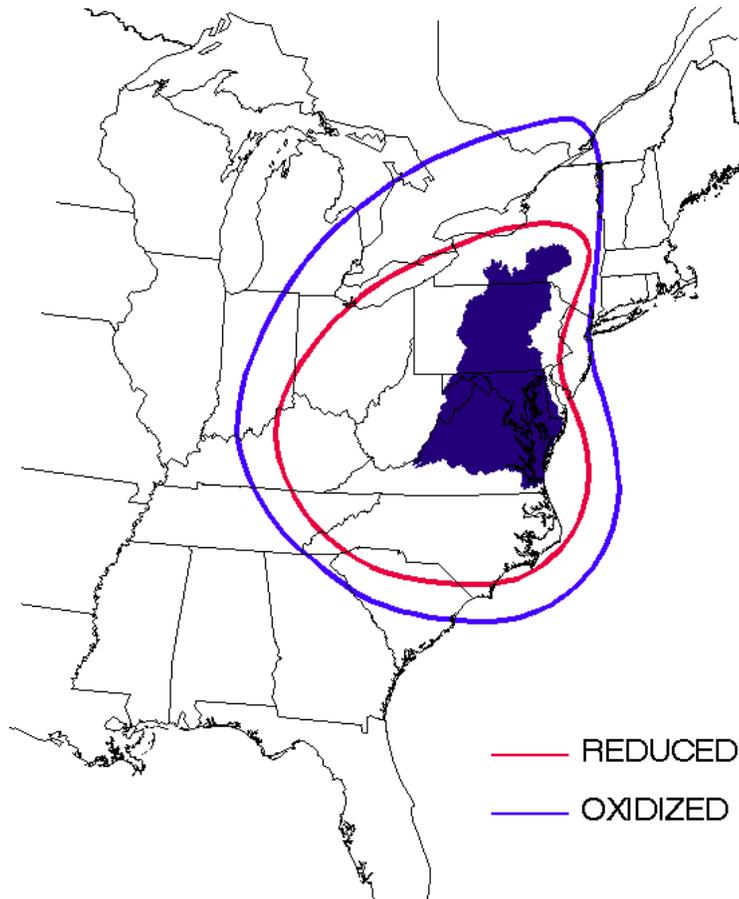


Figure 45: The Chesapeake Bay Airshed for Nitrogen

EPA differentiates between nitrogen deposition occurring on the land and non-tidal waters and deposition occurring directly onto the tidal waters. The deposition on the land becomes part of the allocated load to the jurisdictions. This is because the air deposition on the land becomes mixed with the nitrogen loadings from the land based sources and dealt with through the management measures placed on the land. The nitrogen deposition directly to tidal waters is a direct loading with no land based management controls and therefore needs to be linked directly back to the air sources and air controls.

EPA used the reductions expected from regulations implemented through the Clean Air Act authority to meet National Ambient Air Quality Standards for criteria pollutants in 2020 to base scenarios for future air controls and allocations. According to EPA, the air allocation scenario includes:

- The Clean Air Mercury Rule (CAMR).

- The Best Available Retrofit Technology (BART) used for reducing regional haze, and the off-road diesel and heavy duty diesel regulations.
- On-Road mobile sources: For On-Road Light Duty Mobile Sources this includes Tier 2 vehicle emissions standards and the Gasoline Sulfur Program, which affects SUVs pickups, and vans that are now subject to same national emission standards as cars.
- On-Road Heavy Duty Diesel Rule – Tier 4: New emission standards on diesel engines starting with the 2010 model year for NO_x, plus some diesel engine retrofits.
- Clean Air Non-Road Diesel Rule: Off-road diesel engine vehicle rule, commercial marine diesels, and locomotive diesels (phased in by 2014) require controls on new engines.
- EGUs: CAIR second phase in place (in coordination with earlier NO_x SIP call).
- Non-EGUs: Solid Waste Rules (Hospital/Medical Waste Incinerator Regulations).

EPA included an explicit basinwide nitrogen allocation, which was determined to be 15.7 million pounds of atmospheric deposition loads directly to the Chesapeake Bay and tidal tributary surface waters. If air deposition and expected reductions in nitrogen loading to the Bay are not included in the LAs, then other sources would have to reduce nitrogen discharges even further to meet the nutrient loading cap. Activities associated with implementation of federal Clean Air Act regulations by EPA and the jurisdictions through 2020 will ensure achievement of this allocation and are already accounted for within the jurisdiction and major basin nitrogen allocations. Any additional nitrogen reductions realized through more stringent air pollution controls at the jurisdictional level, beyond minimum federal requirements, may be credited to the individual jurisdictions through future revisions to the jurisdictions' WIPs, two-year milestones, and the Chesapeake Bay TMDL tracking and accounting framework.

Based on consultation with the DNREC's Division of Air Quality, Delaware feels that EPA's 2020 scenario relies on a weak and inadequate NO_x cap of roughly 1.4 million tons annually. Analysis conducted by the Ozone Transport Commission indicates that using highly cost effective and reasonable control technologies will cause this cap to be no higher than 0.9 million tons annually. This is significant because the higher the load allocated to the atmospheric deposition, the lower the load allocated to various watersheds.

Based on available data and information, approximately 1.5% of NO_x emissions will be deposited in the watershed as nitrogen, which means for every 200,000,000 pounds of NO_x, there will be an additional 3,000,000 pounds of nitrogen deposited into the watershed, almost equivalent to Delaware's planning target of 3,391,049 pounds. The difference between a weak Federal program and what could be a more reasonable Federal program is nearly 1,000,000,000 pounds of NO_x emissions, equivalent to 15,000,000 pounds of nitrogen loading to the bay – an amount that is more than 4 times Delaware's allocation.

Therefore, Delaware urges EPA to revise their methodology and set more stringent federal goals for air quality management, as most of the NO_x that is deposited in Delaware, originates in other jurisdictions. Delaware has adopted stringent NO_x emission standards for every individual electric generating unit as well as standards for other fuel burning equipment. There is little left in Delaware's regulatory arsenal to reduce point source NO_x emissions within its boundaries. Even if more stringent air controls were identified and adopted in Delaware, little impact will be realized in the deposition occurring in Delaware's Chesapeake due to the location of Delaware sources and climatic patterns.

12.1 Actions to Address Air Pollution

Delaware has been deeply involved in developing programs and regulations leading to the reduction of NO_x emissions to the ambient air from local, regional, and national sources. These local, regional, and national NO_x emissions may contribute to the nitrogen loading of the Chesapeake Bay and its tributaries. Delaware is also working to quantify the benefits that these programs and regulations may have generated beyond the base used by the EPA and in turn create an offset bank.

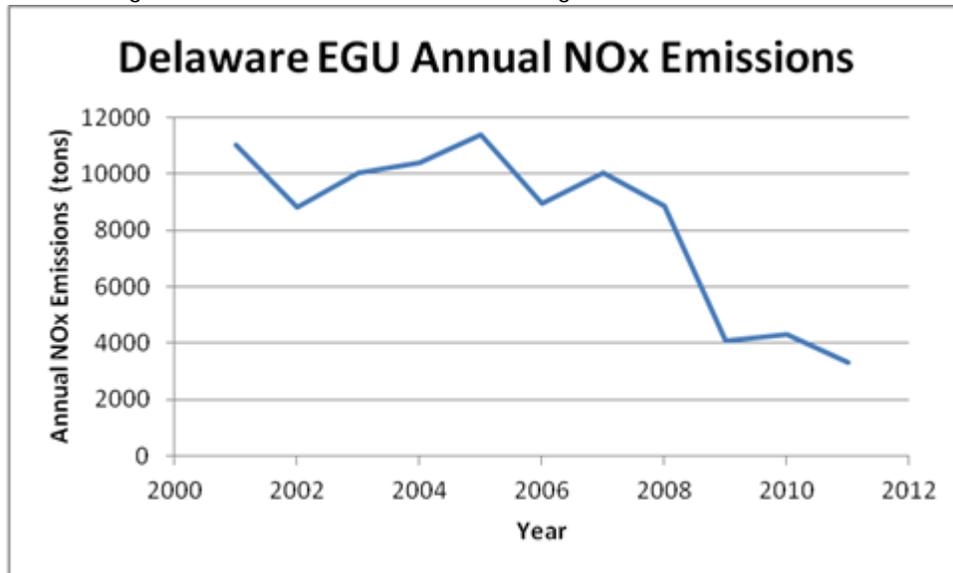
Some of the programs, regulations, and activities in which Delaware has been involved to reduce NO_x emissions include the following:

12.1.1 Local

The State of Delaware has taken many actions in recent years to reduce the NO_x emissions from sources with the state, including the following:

- In 2010 Delaware promulgated regulation 1140, Delaware National Low Emissions Vehicle Program. This regulation adopts vehicle emissions standards, including NO_x emissions standards, in 2014 that are more stringent than those provided in federal requirements. This will reduce the amount of NO_x emissions per mile traveled as these new vehicles penetrate the vehicle population in Delaware.
- Delaware has adopted Regulation 1145, Excessive Idling of Heavy Duty Vehicles, to limit the amount of permissible idling time for heavy duty vehicles. This regulation effectively reduces the unnecessary emissions, including NO_x, from heavy duty vehicles when the vehicles are not in motion.
- In 2011 Delaware revised Regulation 1142, Specific Emission Control Requirements, to require NO_x emissions limitations more stringent than those required under current applicable USEPA requirements for boilers and process heaters used at petroleum refineries.
- In 2006 Delaware promulgated Regulation 1144, Control of Stationary Generator Emissions, to control the emissions, including NO_x, from internal combustion engines used to power electric generating units. The NO_x emissions limitations provided in Regulation 1144 represent more stringent requirements than would be required under current applicable USEPA requirements. It has been estimated that these requirements have resulted in NO_x emissions reductions of at least 70% from the subject population of units.
- Delaware has taken steps to require NO_x emissions reductions from electric generating units (EGUs) beyond those that would have been required from those units by USEPA requirements. Delaware's Regulation 1146, Electric Generating Unit (EGU) Multi-Pollutant Regulation, promulgated in 2006, required progressively more stringent NO_x reductions from certain EGUs beginning in 2009. Delaware's Regulation 1148, Control of Stationary Combustion Turbine Electric Generating Unit Emissions, promulgated in 2007, required NO_x emissions from certain EGUs beginning in 2009. Collectively, these two regulations, and associated consent decrees, have resulted in significant reductions in NO_x emissions from Delaware's fleet of EGUs as shown in the following chart (Figure 46):

Figure 46: Delaware Electric Generating Unit NOx Emissions



- The Delaware Electric Cooperative has requested grant funding to initiate a joint grant program for Delaware growers interested in converting their irrigation system from diesel to electric. The conversion will provide both cost savings to the irrigator and a reduction in local air emissions, including SO_x and NO_x, and particulates. The program offers financial assistance from the Coop to pay for extension of the electric service to the irrigation pumps on the property. Through Energy Efficiency Investment Fund (EEIF³⁰) funds, a second grant would be available for growers that would cover 30% of the installation cost to convert irrigation power source from diesel engine to electric motor. The DEC pilot launched November 1, 2011. The joint program is expected to start January 1, 2012 and run through December 31.

12.1.2 Regional

Delaware is one of the states in the Ozone Transport Region (OTR), a region comprised of 12 states and the District of Columbia that particularly affected by the transport of ozone, and the ozone precursors NO_x and VOC, into the region. Delaware continues to work with the Ozone Transport Commission (OTC) to address ozone, and the ozone precursor NO_x and VOC, transport into the region. The OTC utilizes technical resources to develop guidelines and model rules to assist OTR states in establishing applicable NO_x controls in the respective states. As part of this activity in the last few years, Delaware has participated in:

- The development of a model rule for the control of NO_x emissions from combustion turbine powering electric generators utilized primarily during high electric demand days.
- The development of a model rule for the control of NO_x emissions from oil and gas fired boilers powering EGUs.

³⁰ The Investment fund offers grants and financing for Delaware businesses to make energy efficiency investments and improve environmental performance.

- The development of a model rule for the control of NO_x emissions from stationary generators powered by internal combustion engines.
- The development of a model rule for the control of NO_x emissions from natural gas extraction and transportation activities.
- The development of a model rule for the control of NO_x emissions from gas-fired process heaters and boilers.

12.1.3 National

Computer modeling has also shown that ozone, and the ozone precursors NO_x and VOC, are transported into Delaware and the region from great distances outside the OTR. Delaware has continued to work with elected officials and the EPA to evaluate and address the transport of those pollutants into the region. Following the provisions of the Clean Air Act, Delaware has also requested that EPA require states whose NO_x emissions impact Delaware's air quality be required to install NO_x emissions controls on their EGUs to mitigate the effects of their emissions.

SECTION 13. WATER QUALITY MONITORING

Water quality monitoring has provided evidence of changes in water quality and necessary data to develop models and TMDLs to meet the Clean Water Act goals or restoring the physical, chemical, and biological properties of the Delaware's waters. Delaware has been at the forefront of TMDL development for nutrients in the Chesapeake Bay drainage basin. Monitoring will be needed to document changes as the Delaware and Chesapeake Bay TMDLs are implemented.

13.1 Current Programs and Capacity

13.1.1 Delaware's Surface Water Quality Monitoring Program

Delaware follows a five-year rotating basin scheme to monitor all surface waters of the State. During every five-year cycle, each watershed within the State is monitored monthly for two years and every other month for the remaining three years. Within the Chesapeake Bay drainage, Delaware maintains a network of 24 monitoring stations (Table 49 and Figure 47). Two of the stations, i.e., Station 304191 at Nanticoke River at Rt. 545 Bridge, and Station 302031 at Marshyhope Creek at Rt. 308 Bridge are part of the Chesapeake Bay Program Non-tidal Monitoring Network and are always monitored monthly. In addition to monthly sampling, eight storm samples (two per season) are collected at both of these sites every year. According to the State's five-year rotating basin monitoring schedule, the remaining 22 stations within the Chesapeake Bay Drainage are being monitored monthly during Delaware's Fiscal Year 2011, and will be monitored every other month during the fiscal years of 2012, 2013, and 2014. Please note that Delaware's Fiscal Years start in July 1 of each year and ends in June 30 of the following year.

Surface waters of the State, including waters within the Chesapeake Bay Drainage, are monitored for a suite of 24 parameters including nutrients, chlorophyll a, turbidity, bacteria, organics, pH, dissolved oxygen, etc. (Table 50). It is estimated that water quality monitoring costs for the Chesapeake basin be about \$110,000 for fiscal year 2011. For fiscal years 2012, 2013, and 2014 when monitoring frequency for most stations are reduced to every other month, the monitoring cost is estimated to be about \$60,000. These estimates exclude monitoring for metals that occurs at some stations in the basin and also exclude quality control sampling and other monitoring plans and programs.

Analytical results from the stations is promptly published in the EPA STORET system and are available as part of the STORET network. More details for the Surface Water Quality Monitoring Plan (SWQMP) are available on DNREC's website.

Table 49: Sampling Schedule with Locations and Frequencies, FY 2010-2013

CHESAPEAKE BAY DRAINAGE	STORET Station	Projected Sampling Schedule			
		2010	2011	2012	2013
<i>Chester River</i>					
Sewell Branch @ Sewell Branch Rd. (Rd. 95)	112021	12	12	6	6
<i>Choptank River</i>					
Cow Marsh Creek @ Mahan Corner Rd. (Rd. 208)	207021	12	12	6	6
Tappahanna Ditch @ Sandy Bend Rd. (Rd. 222)	207081	12	12	6	6
Culbreth Marsh Ditch @ Shady Bridge Rd. (Rd. 210)	207091	12	12	6	6
White Marsh Branch @ Cedar Grove Church Rd. (Rd. 268)	207111	12	12	6	6
<i>Marshyhope Creek</i>					
Marshyhope Creek @ Fishers Bridge Rd. (Rd. 308)	302031	12	12	12	12
<i>Nanticoke River</i>					
Nanticoke River @ buoy 45 (near state line)	304071	12	12	6	6
Nanticoke River @ buoy 66 (confluence with DuPont Gut)	304151	12	12	6	6
Nanticoke River @ Seaford WWTF (near boat ramp)	304461	12	12	6	6
<i>Nanticoke River Tributaries</i>					
Raccoon Prong @ Pepperbox Rd. (Rd. 66)	304671	12	12	6	6
Nanticoke River @ Rifle Range Rd. (Rd. 545)	304191	12	12	12	12
Concord Pond @ German Rd. (Rd. 516)	304311	12	12	6	6
Williams Pond @ East Poplar St. (across from Hospital)	304321	12	12	6	6
Bucks Branch @ Conrail Rd. (Rd. 546)	304381	12	12	6	6
Nanticoke River @ Rt. 13	304471	12	12	6	6
Records Pond @ Willow St.	307011	12	12	6	6
Horseys Pond @ Sharptown Rd. (Rt. 24)	307171	12	12	6	6
Gravelly Branch @ Coverdale Rd. (Rd. 525)	316011	12	12	6	6
Trap Pond on Hitch Pond Branch @ Co. Rd. 449 or Trap Pond Rd	307081	12	12	6	6
Deep Creek above Concord Pond, near Old Furnace at Rd. 46	304591	12	12	6	6
Gravelly Branch at Deer Forest Road (Rd 565) on west edge of Redden State Forest Jester Tract	316031	12	12	6	6
Broad Creek at Main Street in Bethel (Rd 493)	307031	12	12	6	6
Nanticoke River at Beach HWY (Ellendale Greenwood HWY) on east edge of Greenwood	304681	12	12	6	6
<i>Pocomoke River</i>					
Pocomoke River @ Bethel Rd. (Rd. 419)	313011	12	12	6	6

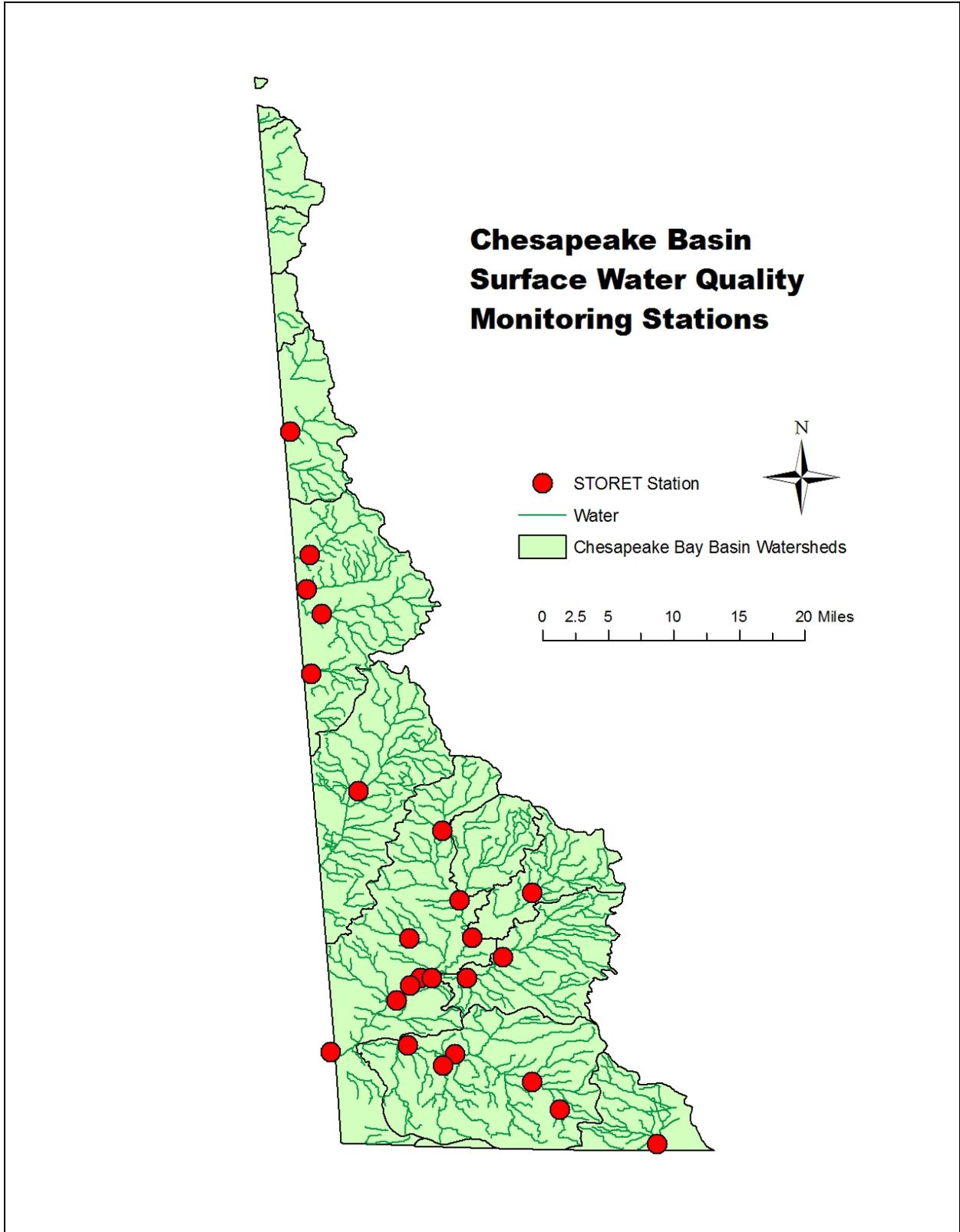


Figure 47: Water Monitoring Stations

Table 50: Water Quality Parameters to be analyzed at all Stations in the Monitoring Network, FY 2011

<i>Parameter</i>	<i>Method Reference (EPA)</i>	<i>Reporting Level¹</i>
<i>Water Column Nutrients</i>		
Total Phosphorus	EPA365.1 M	0.005 mg/l P
Soluble Ortho-phosphorus	EPA365.1	0.005 mg/l P
Ammonia Nitrogen	EPA350.1	0.005 mg/l N
Nitrite+Nitrate N	EPA353.2	0.005 mg/l N
Total N	SM 4500 NC	0.08 mg/l N
<i>Carbon and Organics</i>		
Total Organic Carbon	EPA415.1	1 mg/l
Dissolved Organic Carbon	EPA415.1	1 mg/l
Chlorophyll-a (Corr)	EPA 445.0	1 \square g/l
<i>Biochemical Oxygen Demand</i>		
BOD ₅ , N-Inhib (CBOD)	SM20 th ed-5210B	2.4 mg/l
BOD ₂₀ , N-Inhib (CBOD)	SM20 th ed-5210B	2.4 mg/l
<i>General</i>		
Dissolved oxygen – Winkler ²	EPA360.2	0.25 mg/l
Dissolved oxygen – Field	EPA360.1	0.1 mg/l
Total Suspended Solids	EPA160.2	2 mg/l
Alkalinity	EPA310.1	1 mg/l
Hardness	EPA130.2	5 mg/l
Field pH	EPA150.1	0.2 pH units
Conductivity – Field	EPA120.1	1 \square S/cm
Salinity	SM20 th ed-2520B	1 ppt
Temperature	EPA170.1	°C
Secchi Depth ³	EPA/620/R-01/003	meters
Light Attenuation ⁴	EPA/620/R-01/003	%
Turbidity	EPA180.1	1 NTU
Chloride	EPA325.2	1 mg/l
<i>Bacteria</i>		
Enterococcus	SM20 th ed-9230C	1 cfu/100 ml

13.1.2 Nanticoke River Watershed Baseflow/Groundwater Study

DNREC's Groundwater Protection Branch (GPB) will be completing a groundwater quality study in the Nanticoke River watershed. The intention of this study is to use the data to identify subwatersheds that are yielding excessive loads and target them for intensive nutrient management efforts, including BMP implementation. The United States Geological Survey (USGS) NAWQA analytical protocol for chemical analyses will be used, which is identical to what was done for a groundwater quality study in the Inland Bays watershed. After consultation with experts from the USGS, the GPB has planned to perform the following tasks as part of this groundwater study in the Nanticoke River Watershed.

- **Random Groundwater Sampling** - A 5,000 by 5,000 meter grid was established across the basin. A groundwater sample, from a well, will be randomly taken from each grid area. All wells will be verified to be completed in the unconfined aquifer. Approximately 50 wells will be sampled.
- **Groundwater Base Flow Sampling** - Surface water samples will be taken during high base flow (late February to early April) at selected streams across the basin. Discharge measurements will be taken at the time of sampling.
- **Special Studies** - If time allows, the GPB has selected four specific study areas. The study areas will examine differences in land use and soil types. The study areas include 1) Highly agricultural with moderate to well drained soils, 2) Highly agricultural with poorly drained soils, 3) Highly forested with poorly drained soils, and 4) Highly residential with well drained soils. Surface and/or groundwater samples will be taken in each study area. Surface water samples will be taken at high base flow (late February to early April) and low base flow (August to September). Additional wells will be sampled.
- **Laboratory Parameters** - All water samples (groundwater and surface water) will be sampled for nutrients and major ions. The complete list of parameters include alkalinity, chloride, ammonia as N, nitrate as N, phosphorus, silica, sulfate, calcium, iron, magnesium, potassium, and sodium. Field parameters including temperature, pH, dissolved oxygen, and specific conductance will be taken for all samples.
- **Final Report** - A final report will summarize the results of groundwater quality in the Nanticoke River watershed. Nutrient loads to Nanticoke River will also be estimated.
- **Time Frame** - The tentative timeframe for the project is shown below. All data collection will be completed by September 30, 2011.

Table 51: Nanticoke River Watershed Baseflow/Groundwater Study Timeline

Project Component	Months (2010 to 2012)																	
	2010			2011												2012		
	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M
Project Management																		
Sampling Location Selection																		
Well Sampling																		
Surface Water Sampling																		
Laboratory Analysis																		
Data Analysis																		
Progress Reports																		
Final Report																		

13.1.3 Citizen Monitoring Programs

The Department works with Citizen Monitoring groups such as Delaware Nature Society and the Nanticoke Watershed Alliance's Creekwatcher Citizen Monitoring group to monitor those waters of the State that are not monitored routinely by the Department. DNREC works with the above citizen groups to develop their monitoring and quality assurance programs. In addition, the Department uses Citizen Monitoring data in developing water quality models as well as in preparing the State's biannual 305(b) reports that are submitted to the EPA every two years.

13.2 Accounting for Growth

Delaware's Surface Water Quality Monitoring Program is designed to characterize the water quality condition of the State's surface waters and detect trends in water quality. Therefore, growth would not directly affect the program. However, monitoring results can be used to assess the impact of growth on surface water quality.

13.3 Gap Analysis

Delaware's Surface Water Quality Monitoring Program is funded by State General Funds as well as funds provided by the US EPA Clean Water Act Section 106 Program. The current monitoring effort is designed in part to calculate annual nutrient loads as well as to detect water quality trends in major waterbodies. However, the current funding levels are not sufficient for regular sampling in headwaters that would clearly demonstrate changes in water quality that occur as the result of implementation of BMPs. Additionally, establishment of continuous monitoring for selected parameters at key points in the network may be important data for future modeling efforts and can be implemented with additional funding.

13.4 Strategy to Fill Gaps

The Department will work with the Chesapeake Bay Program and other partners to identify Federal and State funding sources that can be used to develop and implement a comprehensive monitoring plan for headwater streams and continuous monitoring programs at key locations.

The Department has worked with stakeholders, including volunteer monitoring organizations, in the past to address the gaps in water quality monitoring and intends to continue to do so.

13.5 Contingencies

Changes in the Monitoring Plan may be necessitated by budget constraints in the future. However, in those situations, Delaware DNREC will attempt to prioritize its monitoring efforts in such a way that the impact on monitoring within the Chesapeake Bay drainage is minimized.

13.6 Tracking and Reporting Protocols

Data from monitoring is published online by EPA in the STORET data base. The Department publishes an Integrated 305(b) Report and 303(d) List of Waters Needing TMDLs every even numbered year by April 1st. In addition, the Department is participating in data exchange efforts with the Chesapeake Bay Program so that collected water quality data are directly reported to the Bay Program based on approved exchange protocols.

SECTION 14. EDUCATION, OUTREACH, AND VOLUNTEERISM

14.1 Chesapeake Bay WIP Communications Team

The Chesapeake Watershed Implementation Plan Communications Team was formed in December 2010 to develop, review and coordinate information and outreach programs for the Chesapeake Watershed Implementation Plan (WIP).

Prior to December 2010, communications professionals from the Delaware Department of Natural Resources and Environmental Control (DNREC), the Delaware Department of Agriculture (DDA), and the United States Department of Agriculture (USDA; Delaware office) worked cooperatively, but informally, to communicate WIP efforts and assist WIP subcommittees in the developing communications and outreach materials that included press releases, PowerPoint presentations, website pages, Frequently Asked Questions, and other tools.

In Dec. 2010, the WIP Communications Team (WIPCT) was formed and membership was expanded from an informal team to include communications professionals from DNREC's Office of Planning, the Delaware Department of Transportation, and partner organizations – the Delaware Nature Society, Nanticoke Watershed Alliance, and the Delaware Home Builders Association. The Team's role and responsibilities include:

- Develop key messages and education/outreach materials
- Support the education and outreach efforts of the WIP Subcommittees
- Develop a communications strategy and plan with measurable outcomes, focusing on the Delaware waterways of the Chesapeake watershed (and applicable to all of Delaware).
- Develop a watershed wide outreach program that encourages and inspires individuals to take actions for cleaner water.
- Maintain the flow of information and provide liaison between: Federal and state agencies; state and local governments; stakeholder groups; media outlets; collaborating agencies and organizations; and the general public.
- Strengthen and/or create partnerships with other agencies/stakeholders, public and private, and solicit Delaware volunteers from these partnerships.

14.2 Phase I WIP Public Outreach

During the development of the draft Phase I WIP Interagency Workgroup subcommittees invited additional stakeholders to participate in WIP development. Staff also conducted presentations for interested parties outside of subcommittee meetings prior to the submission of the Draft Phase I WIP on September 1, 2010. These presentations included:

- Delaware's Nonpoint Source Annual Committee Meeting – March 18, 2010
- Clean Water Advisory Council Meeting – June 16, 2010
- EPA TMDL Webinar – July 8, 2010
- Delaware Nutrient Management Commission Meeting – 7/13/10
- Delaware Farm Bureau Board – 8/12/10

Over the course of five weeks following the submission of the Draft WIP on September 1, 2010, Interagency Workgroup members traveled throughout Delaware, meeting with town and stakeholder groups, presenting Delaware's Draft Plan. A list of the meetings and presentations are available in Table 52. To make the lengthy WIP document more accessible to the public, a presentation was developed that summarized the main sections of the WIP: Wastewater, On-Site Wastewater, Stormwater, Land Use, Agriculture, Restoration, and Public Lands. The presentation also covered important points of interest, including the purpose of the WIP, the value of the Chesapeake Bay, the causes and sources of pollutants entering the Chesapeake Bay, the Chesapeake Bay TMDL, the impact Delaware specifically has on Chesapeake Bay water quality, Delaware's future load allocations, the process of implementing the WIP, and the consequences set by EPA for missing water quality goals.

During the outreach meetings, particular issues of high concern for the various stakeholders present were also addressed. After the presentations, questions and concerns were answered and discussed. Stakeholders were given the opportunity to submit further questions and comments in writing by October 31, 2010, to be answered by relevant subcommittee members. Many responses have been received from stakeholders, which were reviewed by Subcommittee chairs and addressed as appropriate. A list of all questions and comments received from the public and stakeholders as well as responses is available on the WIP website.

Delaware also presented the WIP at a public forum and Webinar held by EPA. EPA presented the TMDL at a public meeting and webinar on Monday, October 11, 2010 from 5 - 7 pm at the Delaware Technical and Community College, Owens Campus, Arts and Science Center, Theatre, in Georgetown, Delaware.

Table 52: Stakeholder Meetings Schedule

Week 1	9/21/2010 9:00 AM	Town of Laurel
	9/21/2010 11:00 AM	Town of Blades
	9/22/2010 12:00 PM	Town of Delmar – in Dover
	9/23/2010 11:00 AM	City of Seaford
	9/23/2010 1:30 PM	Town of Georgetown
	9/23/2010 3:00PM	Town of Bridgeville
	9/23/2010 4:00 PM	Positive Growth Alliance Board and Interested Members - Lewes
	9/23/2010 7:30 PM	Sussex Conservation District Board - Georgetown
Week 2	9/27/2010 10:00 AM	Sussex County Administrator and staff - Georgetown
	9/27/2010 2:00 PM	Town of Greenwood
	9/28/2010 3:00 PM	Sussex County Association of Realtors - Georgetown
	9/29/2010 10:00 AM	Environmental, Watershed, Land Group Presentation - Dover
	9/30/2010 3:00 PM	Kent County - Dover
Week 3	10/6/2010 6:00 PM	Nanticoke Tributary Action Team - Seaford
	10/6/2010 2:00 PM	Agriculture Stakeholder Meeting - Georgetown
	10/7/2010 6:30 PM	Upper Chesapeake Tributary Action Team - Marydel
Week 4	10/11/2010 ALL DAY	EPA meets with agriculture, local government, and homebuilder stakeholder groups during the day and presents TMDL to

		Delaware public at 5:00PM
Week 5	10/20/2010	Delaware On-site Wastewater Recycling Association Conference - Dover

14.3 Phase II Outreach

In 2011 the following communications, education and outreach materials, activities and efforts have been completed.

14.3.1 Communications, Education and Outreach Materials

- Brochure: "In this together – Delaware's role in cleaning up the Chesapeake waterways"
- Frequently Asked Questions – Phase II Watershed Implementation Plan
- Frequently Asked Questions – Delaware's Confined Animal Feeding Operations (CAFO) Regulations
- Fact Sheet: "The Chesapeake Bay "Pollution Diet" – What it Means for Delaware"
- Delaware Nutrient Management Commission Annual Report published Aug. 1, 2011.
- 2011 Milestones to Reduce Nitrogen & Phosphorus Interim Progress Assessment – June 2011
- PowerPoint: Phase II WIP Guidance, Milestones, Path Forward
- The Bay Barometer – A Health and Restoration Assessment of the Chesapeake Bay and Watershed in 2009 – A Chesapeake Bay Program document with Delaware information
- DelDOT brochure on stormwater runoff pollution: "Working to Protect Delaware's Waterways"
- 8 Posters: WIP Phase II highlighting: partners; partner responsibilities; goals/strategies; progress made; what needs to be completed; and contact information for the following subcommittees: Stormwater; On-site Wastewater; Agriculture; Public Lands; Wastewater; Planning and Land Use; Restoration; and Information and Technology
- posters: WIP Phase II highlighting: partners; partner responsibilities; goals/strategies; progress made; what needs to be completed; and contact information for the following subcommittees: Stormwater; On-site Wastewater; Agriculture; Public Lands; Wastewater; Planning and Land Use; Restoration; Information and Technology; and Communications
- An educational poster, "Where Chesapeake pollution comes from," explaining the origins of pollution and how excess nutrients pollute our waterways. The poster also outlines relative pollution rates for different land uses.
- An educational poster, "Protecting our Chesapeake waterways," showing areas of Delaware in the Chesapeake Bay Watershed and the sources of pollution and impacts on water quality.
- An education poster, "In this together," highlighting the role of homeowners, agriculture, builders/developers and governments in cleaning up our waterways.

14.3.2 Press Releases

Delaware's Chesapeake Plan receives EPA approval (12/29/10)
 Sussex landowners invited to visit the exhibit- Restoration Opportunities for the Nanticoke Watershed – during Delaware Ag Week (1/7/11)
 Reminder for Delaware farmers and other livestock operations to submit Notice of Intent to apply for a CAPO permit (2/9/11)

DNREC Secretary Collin O'Mara and Clean Water Advisory Council announce the next \$16 million of clean water infrastructure projects benefiting Delaware communities (2/16/11)

Conservation assistance available for Sussex County landowners in the Nanticoke River Watershed (3/1/11)

'Forests for People – More Than You Can Imagine' stewardship materials available now to educators and group leaders (3/14/11)

DNREC to offer rain barrels at discount price to Delaware residents (4/21/11)

Nutrient Management Commission's annual report is now on-line (5/6/11)

DNREC accepting grant proposals through Aug. 1 for community water quality improvement projects (6/8/11)

Nanticoke River Watershed Conservancy's recently restored wetland adopted by Woodbridge FFA (6/10/11)

Free workshop on stormwater pond maintenance set for July 30 (7/7/11)

DNREC now accepting grant proposals for surface water project planning (7/19/11)

Your Passport to Green Living awaits at the DNREC Building at the 2011 Delaware State Fair (7/21/11)

Public forums set for Aug. 4 and 11 on Delaware's progress improving water quality in the Chesapeake Watershed (7/19/11)

DNREC Secretary Collin O'Mara and Dept. of Agriculture Secretary Ed Kee will speak on progress improving water quality in the Chesapeake watershed (8/2/11)

Additional public comment and input sought for Delaware's plan for cleaner instate streams and the Chesapeake Bay; Draft Phase II Watershed Implementation Plan now on DNREC's website (11/29/11)

DNREC to hold workshops on water quality improvement projects (12/1/11)

DNREC now accepting grant proposals for surface water project planning (12/16/11)

Delmar's new state-of-the-art wastewater treatment facility unveiled (12/20/11)

DNREC now accepting notices-of-intent for wastewater funding (1/10/12)

Delaware's Concentrated Animal Feeding Operations (CAFO) Regulations Receive EPA Approval (1/24/12)

Division of Watershed Stewardship to hold March 1 public hearing on proposed revisions to sediment and stormwater regulations (2/1/12)

Funding workshops for community environmental projects set for Feb. 14 in New Castle and Feb. 16, 2012 in Smyrna (2/7/12)

Public Forum scheduled on March 7, 2012 on Delaware's plan for cleaner instate streams that drain to the Chesapeake Bay; Public Comment period continues through March 21, 2012 (2/13/12)

Applications Now Due March 9 for Conservation Programs in Delaware (USDA/NRCS) release (2/22/12)

Public Forum scheduled on March 7, 2012 on Delaware's plan for cleaner instate streams that drain to the Chesapeake Bay (3/1/12)

14.3.3 Public Workshops and Forums

- *Highlighting Phase I Accomplishments and introducing Phase II and Subcommittees*
Two public workshops, on Aug. 4 and 11, 2011 were held to present WIP Phase I accomplishments, outline the goals and schedules for the Phase II Plan, and invite the public to participate in the process. A total of 155 Delaware residents attended.

At the workshops, DNREC Secretary Collin O'Mara and Department of Agriculture Secretary Ed Kee welcomed attendees, provided an overview of accomplishments and answered questions. Attendees were invited to visit posters summarizing the efforts of each of the eight subcommittees and discuss issues with subcommittee representatives. A powerpoint presentation by Jennifer Volk, outlined plans for Phase II. Brochures, FAQ's, and other education materials (as listed above) were distributed to workshop attendees.

The general consensus of active participants at the workshops was a distrust of government. Several representatives from the 9-12 Patriots voiced their concerns that WIP is a requirement in order to gain more control and authority over landuse. Others said that WIP was a way for government to control or eliminate growth. The authority of DNREC and EPA was a major concern for participants. Participants echoed the sentiments of those who said that "DNREC is regulating things that they want, not what the people want." Many said that the federal government is encroaching on private citizen rights and some people said that they believed EPA was operating illegally. Many of the participants discounted the science behind the TMDL. Concerns were voiced over the cost of implementation and where funds would be found to pay for projects – given the current economic climate. Some people voiced that WIP efforts could put farmers and others out of business in Delaware.

- *Public Forum: Highlighting Draft Phase II WIP*

On March 7, 2012 a public forum on the state's Draft Phase II WIP was held at the Farmington Fire Hall. The forum highlighted Draft Phase II strategies and goals, progress and accomplishments, and what needs to be done to meet Delaware's milestone goals. The forum consisted of stations with posters, materials and information presented by each WIP subcommittee: Stormwater; On-site Wastewater; Agriculture; Public Lands; Wastewater; Planning and Land Use; Restoration; Information and Technology; and Communications. Other exhibitors included: Delaware Nature Society; Nanticoke Watershed Alliance; Delaware Septic Rehabilitation Loan Program (DNREC's Financial Assistance Branch); and the EPA Region 3. Attendees were given the opportunity to provide written comments. Eighteen Delaware residents attended the forum.

14.3.4 Other Major Outreach/Education Efforts

- Education and outreach at Delaware Ag Week on restoration opportunities for Nanticoke Watershed; includes display and presentation on Jan. 10, 2011 – 300+ attendees
- Media event to announce Clean Water State Revolving Fund projects, including projects in the Chesapeake Bay Watershed; DNREC Secretary Collin O'Mara and EPA Regional Administrator Shawn Garvin on Feb. 16, 2011 – 75+ attendees
- Blackbird State Forest demonstration site for the Rain Gardens for the Bays program. A demonstration rain garden was built with the help of Delaware Forestry Service staff on March 23, 2011.
- Tree planting by the Town of Blades and the Blades Elementary School. Blades is the first Delaware town in the Chesapeake Bay Watershed to work with the Delaware Forest Service to increase its tree canopy coverage and focus on how trees can improve the Watershed. The

elementary School is the first school to be recognized in the Forest Service's "Tree-rific School" program for incorporating trees into the curriculum and promoting "outdoor classrooms."

- Rain barrel educational and promotional initiative by DNREC Watershed Assessment Section to encourage Delaware residents to purchase and use rain barrels to improve water quality and conserve water in April 2011 – 80 rain barrels purchased for use in Sussex County (300 statewide)
- Media event with the Nanticoke River Watershed Conservancy's on the recently restored wetland adopted by Woodbridge FFA on June 10, 2011 – 40+ attendees
- A Public Workshop on June 16, 2011 on the revisions to the *Delaware Sediment and Stormwater Regulations*. A history of the regulation revision process, an overview of the draft regulations and an overview of the technical document were provided. – 11 attendees.
- Meeting of the WIP Stormwater Subcommittee on June 22, 2011 – 9 attendees
- Meeting with representatives of the irrigation and well drilling business community to explain the new Delaware Rural Irrigation Program, July 2011 –15 attendees.
- Delaware State Fair, July 21-30, 2011 – approximately 10,000+ visitors
 - Delaware Rural Irrigation Program, included in Governor Markell's press event at DDA's Agricultural Commodities Building
 - DeIDOT's "Delaware Liveable Lawns" program
 - DNREC's pollution reduction education on the value of riparian buffers and wetlands at DNREC's education building, demonstration rain garden and rain barrel education; water/non-point source pollution education game
- Combined Animal Feeding Operation (CAFO) Public Hearing on the proposed new regulations in August 2011 – 25+ attendees.
- 4th National Conference on Ecosystem Restoration in Baltimore, Maryland on August 1, 2011 – 20 scientists and agency people attended.
- 4th International Nutrient Management Symposium on *Global Issues in Nutrient Management Science, Technology and Policy* on August 21, 2011 – 75 scientists and agency people attended.
- "Delaware Livable Lawns" – A program that is a partnership of DeIDOT, DNLA, and DNREC to target lawn care professions with the goal of reducing fertilizer runoff from private lawns (www.delawarelivablelawns.org) – 1,000+ people have been educated about the campaign.
- USDA Nutrient Tour – Chesapeake Bay Project Charter on September 29, 2011. Media event organized by USDA Rural Development (DE/MD) that showcased a business – the Laurel Tastee Freeze that has profited by the extension of water and sewer infrastructure that benefits water quality in the watershed and the local economy. The event also featured a farm in Maryland that uses treated wastewater for spray irrigation.
- Delaware Onsite Wastewater Recycling Association Workshop on October 12, 2011 – approximately 300 attendees (50 vendors, 10 regulators, 240 regulated community)

- Delaware Forestry Service began an extensive survey of many of the forest landowners in the Chesapeake Bay watershed (3,000 forest owners in Kent and Sussex Counties). The results will help shape future communication and outreach efforts by informing forestry staff of landowner objectives, environmental attitudes, and receptiveness to forest management strategies.

Presentation to Kent County Levy Court and Sussex County Council on the status of work underway on WIP Phase II on Nov. 1, 2011; Deputy Sec. David Small – 20+ attendees
- Presentation at the Delaware Section of American Water Resources Association on Nov. 17, 2011 on Watershed Implementation Plans and Pollution Control Strategies; Jennifer Volk, Environmental Scientist, DNREC – 50+ attendees
- Media event on ribbon-cutting of upgrades at the Delmar Wastewater Treatment Plant on Dec. 16, 2011. The event showcased cutting-edge clean water technologies that meet stringent pollution control limits set by the Chesapeake Bay TMDL. Dignitaries included: Governor Markell, Delaware Senators Carper and Coons, EPA Administrator Shawn Garvin, DNREC Secretary Collin O'Mara, Maryland representatives; Delmar community leaders, and other stakeholders – 75+ attendees and media coverage.
- Presentation to tax ditch managers and guests of Kent Conservation District at the annual Tax Ditch breakfast on January 10, 2012 – 80+ attendees
- Presentation on Jan. 18, 2012 at the Delaware Association of Conservation Districts annual dinner meeting by Secretary Collin O'Mara that included remarks on the Delaware's effort to achieve the goals and milestones of the Chesapeake WIP – 60+ attendees
- Community Outreach Initiative began in Jan. 2012 for Clean Water State Revolving Fund's (CWSRF) Septic Rehabilitation Loan Program. This initiative will identify and secure loans for 100 qualified homeowners through the CWSRF Rehabilitation Loan and Extended Funding Option Loan programs. Targeted areas will be homeowners living in the Chesapeake and Inland Bays Watersheds with failing or out-of-compliance septic systems.
- Delaware Agriculture Week, Jan. 16 - 21, 2012. WIP Phase II information and brochures at conference exhibition hall and distributed to attendees
- DNREC Sediment and Stormwater Program staff participated in a workshop Feb. 8, 2012 for consultants organized by the American Council of Engineering Companies Delaware Chapter and the Committee of 100. Workshop included an overview of the Draft Sediment and Stormwater Regulations and Technical Document and a panel discussion regarding the changes to the regulations – 45 attendees.
- Women in Agriculture Conference, Feb. 9 - 10, 2012. WIP presentation by Jennifer Volk, DNREC. Brochures and information provided at conference exhibit area – 30+ attendees
- Meeting with the Delaware League of Local Governments on February 23, 2012. DNREC staff presented a brief overview of the proposed Sediment and Stormwater Regulations revisions. Approximately 80 people were in attendance, including mayors and municipal officials.

- Public Hearing on March 1, 2012 on proposed revisions to sediment and stormwater regulations – 45 attendees
- **Non-credit Course at Delaware Technical and Community College, Georgetown, DE**
Introduction to Sustainable Development – green jobs curriculum; Offered Fall 2012.
Course consists of 9 modules and a case study. The modules include: smart growth and sustainable design; intro to GIS; water quality and conservation; wastewater methods; stormwater and drainage; habitat and ecosystems; principles of restoration; the coastal challenge and land development; and energy efficiency and renewable energy sources. This class will target local municipal officials and inspectors with the goal of educating every Chesapeake Watershed municipality by 2017. This course is also available to the public.
- **Non-credit Classes at Wilmington University, Rehoboth Beach, DE**
An Introduction to Delaware and the Chesapeake Bay Watershed
"Choose Clean Water." The course covered the Chesapeake Bay from the pristine conditions described by John Smith in the early 1600's to the current application of a "pollution diet" designed to improve water quality throughout the Chesapeake Bay Watershed; 4 sessions: Feb. 3, 10, 17, and 24, 2012;. Developed and taught by Madeleine Russell, M.M.P. (Masters in Marine Policy) University of Delaware
- Delaware's Non-point Source Advisory Committee Conference on March 20, 2012 presentation by Jennifer Volk, DNREC Environmental Scientist on Chesapeake WIP Draft Phase II – 40 attendees

14.4 Partnerships and Volunteers

There are several nonprofit environmental and watershed-based organizations active in the Delaware portion of the Chesapeake Bay Watershed. Two organizations, the Delaware Nature Society and the Nanticoke Watershed Alliance, have extensive experience with education and outreach efforts, which will help inform residents, businesses and visitors within the Watershed of actions that they can take to improve water quality.

14.4.1 Delaware Nature Society

The Delaware Nature Society (DNS) is the pre-eminent non-profit environmental organization in the state. DNS is unique in the way it integrates education as a vital element in its role in preservation, conservation and advocacy. Currently thousands of members support this important work and/or participate in programs, while more than 1,000 volunteers assist the 32 member core staff and interns.

DNS applied for a NOAA B-Wet grant in 2010 and although the application was successful, it was unfunded due to Continuing Resolution. Therefore, the implementation is delayed until funding is allocated. Notice was received in February 2012 that the grant is being funded at a reduced level and on an annual basis. The first grant year starts in July 2012. The grant is a 3-year \$200,000 grant that will focus attention solely on the Nanticoke Watershed. The grant will help promote involvement in the wider Seaford community through school-based initiatives and public educational events on an annual basis. In this way, DNS will promote the importance of sustainable landscaping and the important roles people play in maintaining the health of the watershed.

The Delaware Nature Society applied for and received a 2011 Choose Clean Water Regrant to use in the Chesapeake Bay Watershed to identify and address particular areas of need such as coalition building and outreach. Areas of importance are building collaborative efforts with other nonprofits and extending outreach through educational presentations to various public groups in the Nanticoke Watershed to build public support of Delaware's WIP.

The accomplishments for 2011 include:

- Hiring a part time Chesapeake Bay Outreach Coordinator as part of the "Choose Clean Water" coalition re-grant. The Coordinator developed a PowerPoint presentation focused on the importance of "clean water to present to elected officials, civic organizations, and schools across the watershed. The presentation highlights not only the importance of clean water, but raises awareness of DNS volunteer opportunities such as - Rain Gardens, Backyard Habitats and Technical Monitoring which can help to protect and improve the Chesapeake Bay Watershed. The Outreach Coordinator conducted presentations to the following groups in 2011 & 2012:
 - Ellendale Town Council (8 people)
 - Laurel Town Council (12 people)
 - Seaford 4H (20 people including children)
 - Kiwanis K12 club at Blades Elementary (20 people including children)
 - Master Gardeners Introduction Class (45 people)
 - Seaford Town Council (12 people)
 - Seaford Rotary (20 people)
 - Middletown Town Council (80 people)
 - Greenwood Town Council (12 people)
 - Sussex 4H Leaders (17people)
 - Harrington Town Council (10 people)
 - Phillis Wheatley Elementary School, Bridgeville (235 people)
 - Laurel and Delmar Chamber of Commerce (25 people)
 - Rehoboth/Lewes Girl Scout Troop (14 people)
 - Kent County Levy Court (20 people)
 - Bridgeville Town Council (16 people)
 - Seaford Kiwanis (24 people)
 - Class at Wilmington University (6 people)
 - Sussex County Council (32 people)

Total Groups: 19 Total People Reached: 628

Our 2012 goals include;

- Acquire funding for "We Choose Clean Water" campaign to;
 - Build capacity for building the base of stakeholder support,
 - Shape and promote local policy,
 - Expand outreach to farmers, homeowners and businesses to increase adoption of best management practices,
 - Initiate and actively manage on-the-ground implementation projects.
- Expand our Backyard Habitat TM certification program in the Chesapeake Bay watershed which will;

- Educate the public about the connection of land use & water quality,
- Teach sustainable gardening practices to homeowners,
- Collect measurable data on nutrient reduction through the certification program.

In addition, DNS promotes Chesapeake Bay issues through social media (twitter, Facebook, Voice It Alerts) on a regular basis.

14.4.2 The Nanticoke Watershed Alliance

The Nanticoke Watershed Alliance is a consortium of organizations that fosters partnerships and progress in conserving the natural, cultural and recreational resources of the Nanticoke River watershed through dialogue, collaborative outreach and education. Partners of the Alliance include representatives from other local environmental, watershed and land conservancy groups, local and state government, business and industry, farming, development, tourism, and other entities representing diverse stakeholder interests. The Alliance has three main goals: 1) monitor the health of the Nanticoke River through collaborative relationships with regional experts, local volunteers, and the scientific community to disseminate objective information; 2) develop and promote innovative approaches to management and conservation of the watershed, engaging partners, policy makers, and the public through outreach and education; and (3) support and promote the conservation initiatives of organizations within the Nanticoke River watershed.

The Alliance administers several programs. One of its keystone efforts is the Creekwatcher Citizen Water Monitoring Program, a bi-state river monitoring project developed by the Nanticoke Watershed Alliance in 2006. The Alliance trains local citizens to assess water quality at 37 locations throughout the 725,000 acre Nanticoke Watershed. In order to bring effective conservation to the entire watershed, the Alliance is working to bridge the barriers of state and county lines to produce a plan that encompasses the well-being of all the watershed's residents. During April-November, volunteers collect in-situ measurements of key parameters such as dissolved oxygen and water clarity as well as information on water depth, temperature and salinity, and collect samples for laboratory analysis of nutrients and bacteria. Its Quality Assurance Project Plan has been approved by the EPA's Chesapeake Bay Program, making the volunteers' efforts and resulting data much more powerful for use in river protection and bay cleanup efforts.

Since 2007, the Nanticoke Watershed Alliance has published an annual report of water quality data, and recently adopted the "report card" model in order to make water quality data more meaningful to the general public. The Nanticoke River received a B minus, making it one of the cleanest tributaries of the Chesapeake Bay. The Alliance uses the report card as part of their extensive outreach and education efforts, and the data is sent to the EPA's Chesapeake Bay Program Office and state agencies including DE Dept. of Natural Resources and Environmental Control, MD Dept. of Natural Resources and MD Dept. of the Environment. It is also made available for use by to academic institutions, other organizations and individuals. As the body of data continues to grow, trends in water quality will become more evident and will be used to guide the restoration, outreach and other efforts of the Alliance.

Funding for this effort is provided by the Delaware Dept. of Natural Resources and Environmental Control and the Chesapeake Bay Trust. The Alliance also receives a generous in-kind donation from Envirocorp Labs in Harrington, DE for all water quality analysis. Other program partners include private business and landowners who allow water access for monitoring and as a sample transfer location. As the Nanticoke Creekwatchers Program has continued to grow and gain more public awareness, it has proven to be an excellent way to engage a diversity of stakeholders in the protection of the Nanticoke River.

They have also recently developed a Nanticoke Watershed Management Plan (WMP), a guiding document for local conservation groups, local, state and regional governments, and individuals to work together to balance growth and development with protection of natural and cultural resources in the watershed. An important component of this program was a 1 ½ day conference that invited representatives of diverse stakeholder groups in order to develop a community “vision” for the future of the Nanticoke region. The Alliance also worked to incorporate strategies identified in the Chesapeake Watershed Implementation Plan (WIP) to ensure the document’s compatibility with the TMDL requirements for nutrients and sediment. The Alliance will use the WMP to plan restoration, outreach and other efforts that will support the community vision and WIP efforts. They are also working with local Soil Conservation Districts to pilot the feasibility of narrower buffers on prime agricultural land in an effort to adopt less stringent criteria in cost-share programs. They have recently been named the managing entity for the Maryland portion of the Nanticoke River Water Trail, a component of the John Smith Chesapeake National Historic Trail. They will serve as an interpretive and information center, develop a soft landing and create a map and guide to complement the existing map and guide in Delaware.

The Alliance is also leading the efforts to develop a Nanticoke River Watershed Atlas. The Nanticoke Atlas, anticipated to be available in April 2012, provides color, pull-out maps of watershed features and accompanying text. Divided into twelve sections, the Atlas showcases major land uses, cultural and recreational resources, and major pollution types addressed by the Watershed Implementation Plans. The Alliance will use the Atlas as a major outreach piece in conjunction with the Nanticoke Watershed Management Plan, a document intended to provide recommendations to local governments, conservation and community groups, and individuals on how they can address water quality and other issues facing the watershed. It will also be used at events throughout the watershed, including festivals (i.e. Seaford's Riverfest and the Eastern Shore African American Festival), farmers markets, and volunteer fairs. A digital version of the Atlas will be available for download at no cost, and hard copies will be given to community members, including prominent volunteers (Nanticoke Creekwatchers and the Lower Shore Stewardship Institute graduates), educators, and government liaisons. Modeled after the 1996 Chesapeake Bay Foundation Atlas, the Nanticoke River Watershed Atlas is intended to spur understanding and dialogue about the Nanticoke watershed and its rich resources and will be used as an educational tool.

In addition, they have a robust outreach effort, attending several regional events including the Nanticoke Riverfest, Shad Festival, Nanticoke Jamboree, Seaford Heritage Festival, Salisbury Zoo Earth Day, the Native American Festival in Vienna and the Eastern Shore African American Heritage Festival. They also host a number of events including an annual Nanticoke River Wade In, topical partner meetings, and a public release of the Nanticoke River Report Card. An education and service program for the development of skilled volunteers will be kicked-off in 2012.

The Nanticoke Watershed Alliance is applying for funding to develop an outreach campaign focused on storm water issues and what individuals, homeowners and communities can do to improve water quality. The implementation of this campaign is dependent upon receiving grant funding.

14.4.3 Potential Partner and Advocacy Groups

In addition to the Delaware Nature Society and The Nanticoke Watershed Alliance, the following organizations have been identified for possible partnerships for WIP communications, education and outreach.

- Master Gardeners

- Audubon Society
- Kent County Conservancy
- Students for the Environment
- Delaware civic associations and service clubs in Chesapeake drainage areas:
 - Delaware Home Builders Assoc.
 - Alliance For The Chesapeake Bay, Inc.
 - Sassafras River Association
 - Sierra Club – Delaware Chapter
 - Coalition for Natural Stream Valleys, Inc.
 - Chester River Association
 - Chester River Water Quality Monitoring Program
 - Chesapeake Bay Foundation
 - Chesapeake Bay Trust
 - Choptank Watershed
 - Choptank Tributary Team
 - Friends of the Upper Choptank River
 - Choptank Watershed
 - Delmarva Poultry Industry
 - Delmarva Power
 - Delaware Electric Cooperative
 - Delaware Farm Bureau
 - Nanticoke Watershed Preservation Committee
 - Nanticoke Watershed Conservancy, Inc.
 - Friends of the Nanticoke River
 - Nature Conservancy
 - AgroLab, Inc.
 - University of Delaware
 - Delaware State University
 - Delaware Technical and Community College

14.5 Delaware WIP Implementation: Communications and Marketing Plan

The Communications Subcommittee has developed a Communications and Marketing Plan and will initiate a Communications and Marketing Campaign in 2012. The Communications Subcommittee will use funding from the Chesapeake Bay Implementation Grant and the Chesapeake Bay Regulatory and Accountability Grant to develop and implement the campaign, targeting stakeholders and the general public.

14.5.1 Communications Tools Currently Used

- Presentations to groups and organizations
- Media releases
- Plan Interactive Workshops
- Social Media
- Websites

14.5.2 Communications Tools May Be Added:

E- blasts
Blogs, Letters to the Editor, OpEds
Tabling at special events, education conferences, public festivals
Press conferences and media events
Paid media, including print, radio and television advertisements
Additional Social Media

14.5.3 Goals and Objectives

The Delaware WIP Communications and Marketing Plan has two goals: (1) to increase understanding by stakeholders and the general public of the need, value and regulatory elements of the WIP and (2) to increase voluntary changes in behavior that will support the overall plan goals.

Goal I: Increase understanding of the Watershed Implementation Plan

Provide information on the following:

- Opportunities for learning about WIP
- Current data on status of water quality
- The reasons for improved management of impacts on water quality in Delaware
- The value of improved water quality for Delawareans
- The improvement plan goals and the necessary activities, regulations and policies to accomplish those goals
- The opportunities for public involvement
- The economic and social impact of the improvement plan
- What funding is available to publics and entities for stakeholders affected by regulations and/or policies that are part of the improvement plan
- Resources for obtaining information related to the improvement plan
- Results of WIP

Goal II: Increase voluntary activities that will help accomplish the goals of WIP

Provide information on the following:

- Opportunities for learning about voluntary activities
- Voluntary activities that support the improvement plan goals
 - Creating Rain Gardens
 - Planting buffers and trees
 - Installing pervious surfaces
 - Volunteering for stream cleanup or monitoring
 - Maintaining, upgrading or replacing septic systems
 - Reducing use of lawn chemicals
 - Installing xeriscaping in place of a lawn
 - Using rain barrels
 - Using electric or push mowers
 - Preventing toxic spills
- Value of voluntary activities
- Funding available to support voluntary activities

- Resources for information

Table 53: Activities in support of outreach objectives:

Activity	Begin	Responsible	Output Goal
Presentations to civic, community, business, legislative and other stakeholder groups	June 2012	DNREC AG DelDOT Partner Organizations (See list)	Average 3/mo 36/yr
Hold public workshops and forums	June 2012	Same as above	As needed
Meet with policy makers, legislators	June 2012	Same as above	As needed
Distribute media releases and hold press conferences	June 2012	Same as above	Monthly (and whenever there is a milestone in the plan)
Publish blogs, Letters to the Editor and OpEds	June 2012	Same as above	Quarterly
Tabling at special events, conferences, festivals	June 2012	Same as above	Quarterly
Update and expand elements of website	June 2012	DNREC	As needed
Use social media for updates	June 2012	DNREC AG DelDOT Partner Organizations	Bi-weekly 26/yr
Develop database for use of E-blasts	Database: July 2012 E-Blasts: Aug. 2012	DNREC	Minimum 6/yr

14.5.4 Target Audiences

- general public
- farmers
- developers
- policy-makers, legislators (local and national)
- businesses
- environmental groups and non-profits
- educators

14.5.5 Messaging

Comments and feedback at workshops and in the media have included remarks such as “Why should we be regulating in Delaware to benefit the Chesapeake Bay?” and “How much is this going to cost stakeholders and where will the money come from?” These questions get at the root of much of the opposition to the implementation plan.

To continue with current messaging which focuses primarily on “the EPA’s required TMDL for the Chesapeake Bay” as the impetus for Delaware’s improvement plan, will continue to result in resistance and begrudging compliance.

Also, there is much support in Delaware for improving the water quality, fishery and habitat of the Nanticoke River, the main tributary in Delaware to the Chesapeake Bay. To date, that support has not been fully identified and mobilized in support of the improvement plan goals. New messaging will be developed that takes a forward-thinking, action approach to education that encourages behavior change.

New messaging will emphasize:

- The importance and value of improved water quality to Delawareans in the Nanticoke Watershed (which is our state’s portion of the Chesapeake Watershed).
- The risk of not acting to at least maintain the current water quality of the Nanticoke Watershed.
- Individual responsibility to improve water quality (with more targeting messaging)
 - Responsibility relating to pesticide/fertilizer use
 - Responsibility relating to headwater forested areas of the Nanticoke, Choptank, and Sassafras.
 - Individual voluntary actions that will improve water quality in the watershed:
 - Installing Rain Gardens
 - Installing rain barrels
 - Creating permeable surfaces
 - Testing lawn chemistry and reducing lawn fertilizer. pesticides
 - Switching grass lawns to Xeriscaping
 - Planting riparian buffers
- The “choice” that we can make to improve water quality and that each and every one of us can make a difference – “We Choose Clean Water.”

14.5.6 Possible Branding Strategies

- Develop slogan
- Develop tag line
- Create Mascot
- Enlist an Ambassador
- Organize major watershed event

SECTION 15. FUNDING

The purpose of the funding committee is to coordinate funding sources, including match sources, close funding gaps and achieve implementation milestones described in the WIP, coordinate grant applications when possible, and develop mechanisms to track external expenditures in the Chesapeake Bay Watershed for future reporting. The committee includes representatives from various programs within DNREC, DDA, DelDOT, Sussex Conservation District, Kent Conservation District, and USDA.

Source sector committees for stormwater management, agriculture, onsite wastewater, restoration, and land use have worked to identify funding needs to meet the implementation goals described in the WIP.

15.1 Current Funding Sources

Funding for the implementation of the WIP comes from a variety of sources, including federal grant funds from EPA, USDA, and USFWS. We also receive state general funds which are used for staffing and to match federal grants. Additional funds are obtained by various partners and agencies from non-profit partners and local government partners in the form of grants, in-kind and cash match. Any reduction of state and/or federal funding for programs related to implementation of the WIP will affect Delaware's ability to implement the WIP to achieve TMDL goals.

Chesapeake Bay Implementation Grant (CBIG)

Chesapeake Bay funding will be used by all of Delaware's Chesapeake Bay watersheds between June 2009 and May 2015 to manage a wide range of nutrient and sediment sources. These activities include bringing stakeholders together, evaluating progress through water quality monitoring and BMP data tracking, accelerating implementation of nutrient and sediment reducing activities, and contributing knowledge of new approaches to reduce nutrients and sediment. This work plan proposes to support both traditional and innovative BMPs that are cost effective and sustainable. Technical support and cost share funding will be provided for more traditional agricultural BMPs such as manure relocation and cover crops, while the effectiveness of targeting irrigation to reduce nutrient loadings will be investigated. The Nanticoke Restoration Strategy will be implemented, leading to stream restoration types of projects. Efforts will also be expended in the urban sector to install nutrient reducing practices like rain gardens on existing developed lands. Further education and outreach will also be done to promote the use of new green development practices.

Chesapeake Bay Regulatory and Accountability Grant (CBRAP)

Delaware would not be able to achieve its water quality goals for the Chesapeake Bay without assistance from the Chesapeake Bay Regulatory and Accountability Program grant (CBRAP). The CBRAP grant addresses four objectives. The first is the development of the TMDL Watershed Implementation Plan and Milestones, which will detail the necessary steps to minimize pollutant inflow to the Bay and achieve the TMDL set by EPA. As a result of the grant, DNREC will be able to provide the timely development and submittal of required Phase I and II WIPs. Additionally, stakeholders from partner agencies and each nutrient and sediment source sector as well as the general public will be engaged to obtain additional input into the development and implementation of the WIP. We will work with local governments as well to model future land use to better assess and manage future loads. As a result, Delaware will be able to propose and implement effective strategies to reduce nutrient and sediment loads to local impaired waters and the Bay in accordance with the timeline provided by EPA.

The second objective is to improve and expand regulation of sources of nitrogen, phosphorus, and sediment delivered to the Bay. As a result of the grant, Delaware's regulations for industrial stormwater sites will be revised to address the Chesapeake Bay TMDLs, as well as other TMDLs established within the State of Delaware. The regulations will also establish new guidelines that reflect new federal mandates, implement stricter standards such as the inclusion of effluent limitations, and require stricter reporting requirements. In addition, the grant is providing funds to develop Technical Standards for Sediment and Stormwater Regulations which will:

- Incorporate runoff reduction approaches in the new DURMM model to provide a tool that is both unique to Delaware and serve as a practical tool for the stormwater designer. Professional engineers and designers will be more successful in meeting regulatory requirements utilizing tools that enable them to take advantage of the available science and technology.
- Provide technical specifications for Green Technology Practices that will be utilized to optimize land development toward the goal of 0% effective imperviousness for new development. The technical specifications will be consistent with other Bay area specifications that are being utilized to maximize pre-development hydrology.
- Provide training functions each year for agency review personnel to ensure they are consistently applying the standards based approach in the new regulations, provide training functions annually for the regulated design community to transfer technology associated with the new design approaches and standards. New projects associated with the use of these practices should achieve the percent load reduction to meet the TMDL as well as meet runoff reduction goals of 0% effective imperviousness.

New regulations for a Nutrient Offset and Trading program will be developed in accordance with EPA guidance to address future growth and unmitigated loads. Finally, the Department will continue to work to develop and issue permits and provide technical assistance for permit compliance.

Thirdly, the CBRAP grant will provide for enforcement and compliance assurance. Compliance inspectors will make certain that agricultural, wastewater, and storm water related practices have been installed properly and are being maintained to achieve adequate nutrient or sediment goals. This grant will provide:

A compliance inspector in Sussex County to inspect every acre to ensure that cover crops are planted at the appropriate time and that no manures or fertilizers are spread on the cover cropped fields. In the spring, the inspector will again inspect each field for compliance for approved destruction methods and to ensure that no manure or fertilizer applications occurred. In the fall of 2009, there were over 15,000 acres of cover crops planted in the Chesapeake Bay Watershed in Sussex County.

Delaware has nearly 400 industrial storm water sites. The addition of an environmental scientist will allow for increased inspections of these sites. It is estimated that the addition of this staff will result in completion of up to 250 inspections per year. Although the Industrial Stormwater Program currently requires that sites be inspected once every three years, the Surface Water Discharges Section has a goal of inspecting each site at least annually to provide updated data to the Chesapeake Bay Program.

A staff person to work with approximately 240 CAFO permittees in the Chesapeake Bay Watershed through the NOI and permit approval process. Schedule public workshops and hearings as necessary to review NOIs, conduct audits and inspections as necessary at each operation to ensure compliance with the new CAFO regulations and provide educational and technical support.

A Targeted Onsite Wastewater Inspection Compliance Program will be developed, focusing on conducting inspections in areas with high levels of nutrients and those within 1,000 feet of tidal waters and

wetlands. The purpose is to identify failing systems and work with property owners to repair or replace systems with better treatment.

Lastly, a portion of funding from the grant is improving tracking and accountability. Sussex and Kent Conservation Districts have delegation over the Sediment and Stormwater Program. The Conservation Districts' responsibilities include review and approval of sediment and storm water management plans, construction inspection, maintenance inspection, and outreach and education. Funding will provide for:

- Inspection of all closed out projects constructed in the Chesapeake Bay Watershed since 1991 and provides storm water maintenance report/technical guidance on how the BMP is designed to function and its proper maintenance. Recommendations will be generated on improvements that can be made to increase removal of nutrients through the implementation of practices such as buffers, meadows, native landscaping, and other practices.
- Inspection of all 59 tax ditch systems in Kent County.
- An up-to-date GIS data layer for industrial storm water sites within the State, and the creation of a "mapbook" for inspection sites within the State.

National Fish and Wildlife Foundation Chesapeake Bay Stewardship Fund

DNREC has been awarded a \$100,000 Small Watershed Grant from the NFWF for FY2010. DNREC is partnered with federal, state, local, and non-governmental groups to reduce nutrients and sediment from urban and rural nonpoint sources in the headwaters of the Chesapeake Bay using innovative storm water retrofits and riparian, channel, and wetland restoration techniques. The proposal includes prioritization of urban retro-fit and restoration opportunities within the Delaware portion of the Chesapeake Bay Watershed, targeting sub-watersheds primarily in the Nanticoke, Chester and Choptank Watersheds to focus implementation using innovative techniques. This approach addresses two of the key challenges identified by the National Fish and Wildlife Foundation, focuses within the geographic priority areas and provides holistic strategies to address all major sources of nutrients while providing outreach, technical assistance, implementation and monitoring.

The full implementation of this proposal is scheduled to result in a the restoration of up to 1.5 miles of tax ditch and stream channels by reestablishing natural floodplains and reconnecting channels to floodplains, and restoration of up to 10 acres of freshwater wetlands down gradient of agriculture areas, as well as the validation of nutrient and sediment reduction efficiencies for these practices.

In 2011 the Town of Bridgeville was awarded \$75,000 to develop a regional master plan, with model ordinances and pattern book to meet the TMDL. The Town of Bridgeville, in partnership with the University of Delaware Sustainable Coastal Communities Initiative, Delaware Office of State Planning Coordination, and Department of Natural Resources and Environmental Control propose to develop a comprehensive master planning and outreach initiative tailored to rural towns and citizens focused on sustainable growth principles to meet the goals of the Chesapeake Bay TMDL and to be a model community in the Chesapeake Bay Watershed. Delaware communities located in the Chesapeake Bay will need to make significant reductions in nutrients and sediment if they wish to grow in the future. This initiative will focus on engaging residents and stakeholders using a multi-media approach, identifying and addressing urban nutrient sources to meet the TMDL at a local level, an develop a plan that will allow for future growth in this community in a sustainable way.

In 2012 the NFWF program has over \$10 million in grants and technical assistance available for projects in the Chesapeake Bay Watershed. Projects focused on green infrastructure improvements, conservation on private lands, urban Stormwater management, improving local government capacity and citizen based stewardship will be funded. DNREC intends to work with our local government partners as well as other partners to submit proposals for this funding.

Section 106 Grant

Delaware and EPA have developed work plans for the Section 106 NPDES Permit/Enforcement activities under this grant. These work plans seek to initiate a closer coordination and integration of EPA and state permitting/enforcement activities. Several of the activities are focused on the Chesapeake while others are focused statewide and will have a benefit in the Chesapeake. Below is a summary of the five work plans contained in the draft final FY2012 grant.

1. Chesapeake Bay Watershed Point Sources
 - a. Goal – Incorporate Chesapeake Bay Total Maximum Daily Load (TMDL) Waste Load Allocations (WLAs) into point source permits and to ensure compliance for construction schedules and limits.
 - b. State Activities:
 - 1) DNREC will incorporate WLAs into significant permits as the permits come up for renewal; DNREC will submit to EPA for review, all draft permits as they are developed that incorporate the TMDL WLAs
 - 2) DNREC will provide quarterly updates on permit compliance with the TMDL via the PCS database; DNREC will participate in QEM calls to provide necessary information to support enforcement activities
2. Concentrated Animal Feeding Operations (CAFOs)
 - a. Goal – Ensure that permitting and compliance activities meet environmental regulatory and statutory objectives.
 - i. Chesapeake specific objectives – Ensure all CAFOs obtain NPDES permit coverage sufficient to meet the Delaware and national program goals for CAFOs; Permits issued to CAFOs are protective of water quality and, where applicable, meet the objectives of the Chesapeake Bay TMDL.
 - b. State Activities:
 1. DNREC will work with EPA to ensure that DE's CAFO program is consistent with the intent of federal regulations for CAFOs. If needed, DNREC will submit a schedule to revise its program to address any inconsistencies between the DE program and federal CAFO regulations;
 2. DNREC will submit relevant supplemental information to ensure EPA has a complete technical standard for review and respond to comments. If needed, DNREC will submit a schedule to revise the technical standard to address any inconsistencies between the DE standard and federal requirements;
 3. DNREC will develop and submit a permit strategy for ensuring applicable CAFOs obtain permit coverage. The strategy will include an initial list of all known CAFOs identified by DNREC, and their permit status;
 4. DNREC will provide a complete draft permit and permit application package including the nutrient management plan for EPA review and comment unless waived by EPA;
 5. DNREC will develop a FY 2012 Compliance Monitoring Strategy (CMS) that ensures CAFOs comply with permit application and permit requirements. DNREC

2. EPA will work with DNREC to develop a PQR action item implementation schedule;
3. EPA will track progress toward completion of PQR action item milestones;
4. EPA will review targeted new and reissued permits to ensure consistency with regulatory requirements.

Clean Water State Revolving Fund Program (CWSRF)

The Federal Water Pollution Control Act (Clean Water Act), as amended in 1987, established the Clean Water State Revolving Fund (CWSRF) program. The CWSRF program offers low interest financing agreements for wastewater treatment, nonpoint source pollution control, and watershed and estuary management.

CWSRFs offer:

- Low interest rates, flexible terms
- Significant funding for nonpoint source pollution control and estuary protection
- Assistance to a variety of borrowers
- Partnerships with other funding sources

Clean Water State Revolving Fund (CWSRF) programs combine the federal and state capitalization funds with other program resources including tax-exempt revenue bond proceeds, fund investment earnings, and loan repayments to provide low-interest loans for eligible projects. Some of the programs include:

- Wastewater Infrastructure Loans
- Green Project Reserve
 - Reduced CWSRF Interest Rates are used as incentives to encourage borrowers to submit projects for funding consideration
 - Energy Efficiency – technologies and practices to reduce the energy consumption for water quality projects
 - Water Efficiency – technologies and practices to deliver equal or better services with less water
 - Green Infrastructure – practices that manage and treat stormwater, and that maintain and restore natural hydrology by infiltrating, capturing and using stormwater
 - Environmentally Innovative Projects – practices that demonstrate new/innovative approaches to managing water resources in a more sustainable way, including projects that achieve pollution prevention or pollutant removal with reduced costs
- Non-point Source Loan Program
 - Septic Rehabilitation Loan Program (SRLP) -- The SRLP provides financial assistance to moderate to low income homeowners to replace failing septic systems
 - Agricultural Non-Point Source Loan Program (AgNPSLP) -- AgNPSLP funds are leveraged with Federal and State Cost Share assistance from Conservation Districts, to provide loans to poultry and dairy producers for manure storage/management, dead bird composters, and front end loaders.
 - Leaking Storage Tank Remediation Loan Program (LSTRLP) -- The LSTRLP provides loans to remove, retrofit, clean up contaminated sites, and corrosion protection for leaking underground storage tanks
- Land Conservation Loan Program

- The LCLP is an innovative financing approach to fund land conservation easements and fee simple land purchases with CWSRF wastewater loans

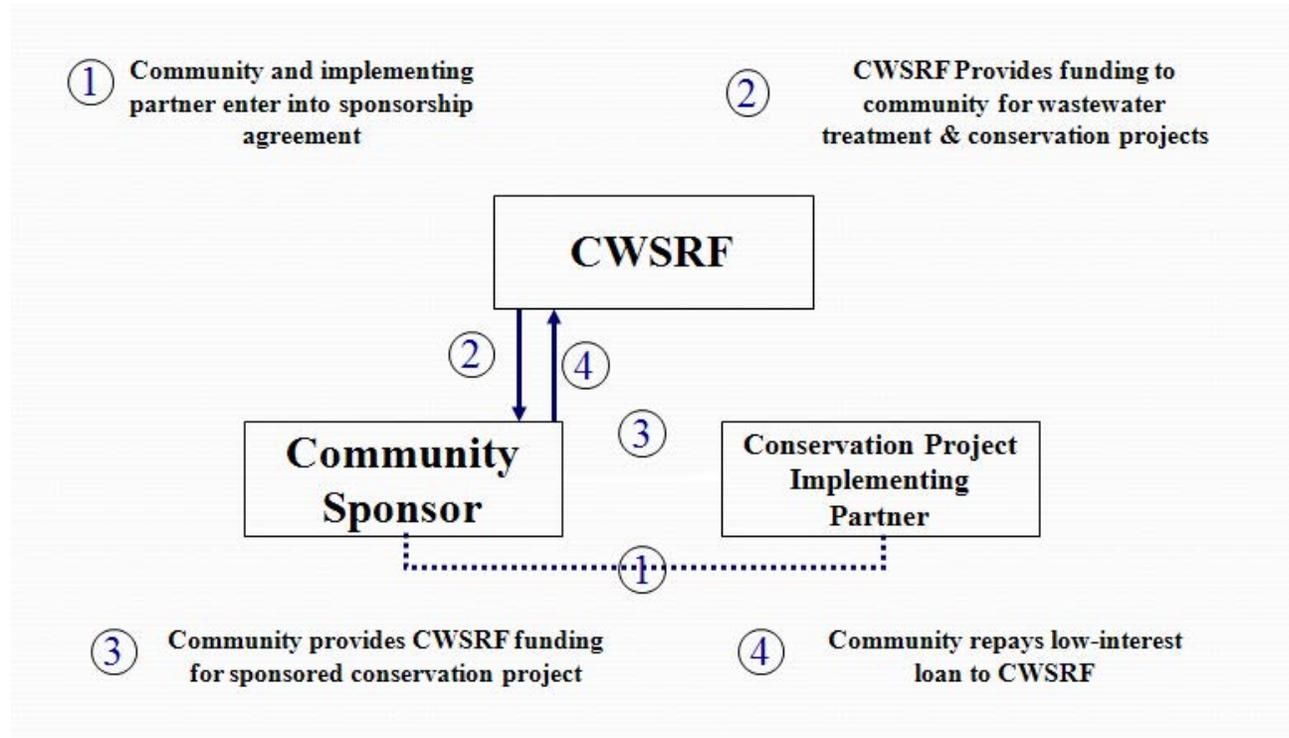


Figure 48: Diagram explaining how CWSRF funds are utilized

Another water infrastructure funding source is the Non-Federal Administrative Account (NFAA). The NFAA consists of:

- Septic System Extended Funding Option Program (SEFO)
 - SEFO is innovative solution to ensure that moderate to low income homeowners who are denied SRLP loans are able to receive financial assistance to replace failing septic systems
- Wastewater Facility Planning Matching Grants
 - Wastewater Facility Planning Matching Grants are designed to assist municipal and county wastewater utilities to prepare wastewater projects for funding through the CWSRF Program.
- Surface Water Matching Planning Grants
 - Surface Water Matching Planning Grants are designed to support the planning, preliminary engineering, feasibility analysis for surface water improvement projects and activities that focus on the developed landscape to improve water quality in impaired watersheds in Delaware.
- Community Water Quality Improvement Grants
 - Community Water Quality Improvement Grants support water quality improvement projects in impaired Delaware watersheds. Competitive grant proposals focus on the developed landscape to improve water quality and address one or more of the following goals:

Improve water quality in designated impaired watersheds
Consistent with specific plans developed for watershed improvements
Demonstrate innovative and sustainable methods, techniques, and/or practices
Cost effective and measurable results

Septic Systems

An initiative that improves water quality and protects the health of streams and rivers in Sussex County by reducing the number of failing septic systems in the Chesapeake Bay and Inland Bays Watersheds is underway. The initiative will replace 100 failing septic systems in 2012 by identifying and securing qualified loan applicants for the Delaware Clean Water State Revolving Fund's Septic Rehabilitation Loan program and the Septic System Extended Funding Option program. This initiative will use the services of First State Community Action, a non-profit grassroots organization with a proven ability to access the needs of homeowners in low-to-moderate communities.

Financial Assistance Branch (FAB)

The Financial Assistance Branch (FAB) of DNREC provides planning, engineering and financial assistance to a broad range of customers that request help in preventing or eliminating activities that cause water pollution. Branch activities include:

- Providing wastewater planning grants for the development of general wastewater facility plans, long range wastewater facility plans, and regional wastewater facility plans.
- Providing engineering and technical assistance for developing new sanitary sewer districts and/or solving problems in existing sewer districts. The Branch provided assistance that has led to the development of the Ellendale Sanitary Sewer District, the Northeast Sanitary Sewer District (Leipsic), the Kenton Sanitary Sewer District, and the Farmington Sanitary Sewer District. Sanitary sewer systems are either under design or construction for each of these communities. Assistance is currently being provided for two additional areas.
- Providing financial assistance in the form of economic feasibility studies, low interest loans, and grants for wastewater projects that eliminate sources of pollution or prevent future sources of pollution. Financing is available to municipalities for community wastewater management facilities, to individuals for the rehabilitation of failing septic systems, to dairy and poultry farmers for the implementation of manure management practices on their farms, and to individuals and businesses for underground storage tank sites that need groundwater cleanup. Financial assistance in the form of determining the economic feasibility of a project is also provided to communities with water utilities.

The Delaware Nonpoint Source Program

The Delaware Nonpoint Source (NPS) Program administers a competitive grant made possible through Section 319 of the Federal Water Pollution Control Act (Clean Water Act). The grant provides funding for projects designed to reduce nonpoint source (NPS) pollution in Delaware. NPS pollution may be defined as any pollution that originates from a diffuse source (such as an open field or a road) and is transported to surface or ground waters through leaching or runoff. Reduction of NPS pollution may often be achieved through incorporation of specific best management practices (BMPs) into project workplans. Projects may target any source of NPS pollution, but most frequently involve agriculture, silviculture, construction, marinas, septic systems, and hydromodification activities.

Eligibility for NPS Program Funding

A project can be sponsored by both public and private entities, including local governments, tribal authorities, cities, counties, regional development centers, local school systems, colleges and universities, local nonprofit organizations, state agencies, federal agencies, watershed groups, for-profit groups, and individuals. Project grants to individuals are limited to demonstration projects.

Priority will be given to those projects whose goal is to improve the water quality of water bodies identified as having nonpoint source pollution impairments, as documented in:

- The current 303(d) List as impaired due to a nonpoint source pollutant;
- The current 305(b) Report as not fully supporting a designated use due to a nonpoint source; or
- Any other documentation of nonpoint source pollution

The NPS Program may also prioritize funding according to additional environmental factors, such as land use and existing best management practices, if these factors can help determine where projects will be most effective at reducing nonpoint source pollution. Projects are usually one to three years in length. Grant recipients that failed to meet program requirements in the past may be ineligible to receive additional project funding.

Resource Conservation and Development Fund

The state has utilized a special fund named the 21st Century Resource Conservation and Development (RCD) fund to finance major and minor flooding and drainage projects throughout the state for the past 16 years. While these funds are limited, there should be a concerted effort to integrate water quality management in a retro-fit manner into projects funded through this revenue stream.

The Department will also aggressively seek additional funding and work with the partners to identify resources and utilize them to the extent possible to meet the growing demands for funding nutrient reduction strategies and retro-fits within the Bay watershed.

The table below summarizes the programs described above and the estimated levels of funding available for TMDL and WIP implementation between 2009 and 2016. The funds identified are typically not available to all sources sectors, therefore the total estimated funds available does not necessarily cover the estimated funds that will be needed to implement the WIP through 2017 levels.

Table 54: Known Funding Sources and Levels of Funding* between 2009 –2016³¹

Source of Funds	Funding Amount	Activities to be funded
State General Funds ³²	\$14,000,000	Implementation, Education/Outreach, Program Administration, Technical Assistance, Monitoring, State Cost Share/Match.
Delaware Nonpoint Source Program (CWA 319)	\$3,500,000	Implementation and Program Administration
CWA 106	\$700,000	Monitoring
Chesapeake Bay Implementation	\$3,000,000	Implementation

³¹ This is not an exhaustive list of funding sources. This list will be updated as funding sources are identified.

³² Funds to DNREC for cost share and match funds for some grants. Does not take into consideration State GF received for Agland Preservation by DDA or any other programs, nor all staffing used to implement WIP programs and projects.

Grant (CBIG) ³³		
Chesapeake Bay Regulatory and Accountability Grant (CBRAP) ³⁴	\$1,549,555	Regulatory Development, IT Support, Planning, permitting, technical assistance
USDA NRCS Farm Bill Programs ³⁵	\$48,940,000	Technical and Financial Assistance, Cost Share, staff
Clean Water SRF ³⁶	\$268,000,000	Total loan portfolio available statewide through 2016 for municipal loans related to wastewater and surface water management.
21st Century Resource Conservation and Development (RCD)		Implementation of drainage and stormwater improvements
National Fish and Wildlife Foundation Small Watershed Grants (NFWF)	\$175,000	Implementation and Planning in 2010 and 2011. Grant requires 25% local match. This is a competitive grant which can be applied for annually.
Delaware Forest Service ³⁷	\$962,500	Cost Share, grants available statewide to qualified landowners, communities, and municipalities.
USDA Rural Development		Low Interest Loans/Grants for WWTP upgrades
DelDOT		Mitigation, Stormwater Improvements for state roads
Private ³⁸	UNKNOWN	Implementation match for federal projects and cost share
Other ³⁹	UNKNOWN	
Local Governments	UNKNOWN	Match for federal and state projects including BMP, restoration, WWTP upgrades, etc.
Local Non-Profit Organizations ⁴⁰	UNKNOWN	Implementation, Match, Volunteer
TOTAL ESTIMATED FUNDING 2009-2016		

*Estimated levels of funding from 2009 – 2016. 2013-2016 assumes reductions of current funding levels each year.

15.2 Source Sector (Subcommittee) Funding Needs

³³ Funds provided by EPA, assumes \$500,000/year.

³⁴ Funds provided by EPA CBP for FY10 and FY11. We are currently unaware if funding will be available in the future.

³⁵ Based on 40% of total annual budget with 5% decrease each year from 2012.

³⁶ Assumes \$5,000,000 annual funds from federal sources plus 20 percent match from local sources.

³⁷ Combined Federal and State funds provided to the Forest Service for urban and community forestry, forest stewardship and hazard mitigation.

³⁸ Includes but not limited to private landowners, private businesses and industry related organizations such as Delmarva Poultry Industry, Nursery and Landcape Association, Homebuilders Association of Delaware, etc.

³⁹ Includes but not limited to University and Colleges, Churches, Conservation Districts, Cooperative Extension, etc.

⁴⁰ Includes but not limited to: Delaware Nature Society, Delaware Center for Horticulture, Nanticoke Watershed Alliance, The Nature Conservancy, Delaware Wildlands, etc.

Source sector committees for stormwater management, agriculture, on-site wastewater, restoration, land use, and communications have worked to identify funding needs to meet the implementation goals described in the WIP. These needs include, by sector:

Wastewater

Funds are needed for State and Federal resources to include grants to make upgrades to existing waste water treatment facilities affordable for local communities.

- The Town of Bridgeville will be required to upgrade and/or make operational improvements to their plant between 2012 and 2017. Depending on the path forward selected, costs could approach \$12million.
- The Town of Greenwood is considering the option of building a packaged wastewater treatment facility to treat local wastewater. Estimated costs for this option could exceed \$3 million.
- If the Town of Laurel expands their existing sewer district to account for future growth, up to \$2,000,000 will be needed to expand infrastructure and connect existing homes to the system. An additional \$5,500,000 may be needed to pay for engineering costs and land for system upgrades.
- If the City of Seaford expands their existing sewer district to account for future growth, and/or decides to purchase land to eliminate or reduce direct discharge up to \$6,500,000 may be needed for land purchases, engineering, etc. Additionally Seaford spends up to \$2,000,000 in annual improvements and maintenance for their current BNR system.
- Up to two additional FTEs to address NPDES permit backlog, provide technical and/or compliance assistance for NPDES permittees; and administer the CAFO program at DNREC. As of 3/2012, approximately 400 CAFO NOIs have been submitted and one CAFO permit issued statewide. CAFO staff at DDA has also identified additional operations that may qualify for permits in the future and outreach will be needed to work with those property owners. Approximately \$140,000 annually for 2 FTEs.

Onsite Wastewater

In order to improve compliance and increase participation rates by 20%, additional funding will be needed to provide greater outreach, staffing, and technical resources. Additional needs to fill gaps are identified below:

- The Section would be better served by increasing the staffing levels by one additional FTE. Additional staff or staff movement will likely be needed to maintain a new aggressive operation and maintenance inspection program in addition to the current operation and maintenance program for the innovative and alternative system requirements, and data collection. Estimated cost - \$50,000 annually.
- Improvements to tracking and reporting of pump-outs and inspections, advanced treatment units, connections to central sewer, and waste haulers. Delaware's Environmental Navigator, a data management system, needs improvements. Estimated annual cost for database management and upgrades - \$50,000.
- Staff training in advanced treatment units for permitting, inspection, operation, and maintenance requirements.

- Targeted onsite Wastewater Inspection Compliance Program to provide cost share for onsite wastewater inspections in targeted areas identified in the proposed onsite regulations.⁴¹
- State and Federal funding resources are needed to include grants to make municipal systems affordable and to help low-income on-site users replace or repair failing systems and/or install nutrient reducing technologies.^{42, 43}

Stormwater Management

The Stormwater Subcommittee will aggressively seek additional funding and work with the towns, municipalities and the Conservation Districts to identify resources and utilize them to the extent possible to meet the growing demands for funding stormwater source reduction strategies and retro-fits within the Bay watershed. Additional funding needs include:

- GIS data management and system upgrades, \$5,000. (CBRAP)
- Revised regulations for industrial storm water management, \$69,000. (CBRAP)
- New and revised technical standards and Regulations for Stormwater management practices, \$315,000. (CBRAP)
- Additional training program for staff, permittee, and system owners and operators, \$50,000. (CBRPA)
- Outreach to system owners and operators regarding new requirements, \$50,000. (CBRAP)
- Additional maintenance inspections on storm water facilities in Kent and Sussex Counties - \$120,000 annually for two contractual positions, one in each county. (CBRAP for 1 year, additional funds needed to continue inspection program).
- Staff to conduct increased number of industrial compliance inspections and enforcement, approximately \$63,000 annually for one FTE. Funds provided by CBRAP for 3 years, additional funds will be needed to continue program.
- Urban retrofits inventory \$150,000
- Municipal urban storm water retrofit demonstration projects, at least one per community, ten communities. Estimate \$200,000.
- Storm water Retrofits: \$140 million

Land Use

The Land use Subcommittee will require funding to:

Develop Delaware Nutrient Offset and Fee In Lieu Program to include at minimum the development of new regulations, research related activities, outreach, services related to tracking and implementing offsets, and development of a credit registry. At least one FTE will be needed to help develop and build an offset program as well as to administer program once in place, at a minimum of \$70,000 annually. The Subcommittee has currently requested \$105,000 from the CBRAP to develop the regulations. Additional funding will be needed to implement the program.

Work with local governments to develop Master Plans for Bridgeville/Greenwood; Laurel/Bethel; Seaford/Blades; Ellendale; Farmington; Hartly; Middletown; and Delmar. The

⁴¹ The program has requested \$147,329 from the CBRAP grant to conduct inspections and outreach to affected property owners.

⁴² See [Community Financing for Septic Management in the Inland Bays Watershed](#) prepared by the Environmental Finance Center January 29, 2008.

⁴³ Chesapeake Bay Implementation Grant; SEFO

Subcommittee has requested \$177,000 from CBRAP to fund this effort in partnership with the University of Delaware; the town of Bridgeville has been awarded a NFWF Small Watershed grant in the amount of \$75,000 to develop a Master Plan for their sewer district.

Conduct outreach with stakeholders and decision makers regarding land use, planning, and nutrient offsets.

Planning and implementation funds to implement strategies for effective communication with local governments and stakeholders

Agriculture

Realizing a significant boost in funding will be warranted for full implementation of BMPs. Delaware will need to pursue increased funding through State programs such as the State of Delaware Conservation Cost Share Program, Delaware CREP Program, Delaware Nutrient Relocation, Delaware CAFO, and Delaware Nutrient Management Programs. Likewise, it is essential Federal Programs, such as EQIP and the Chesapeake Bay Program Grant, be expanded or re-prioritized within the Chesapeake Bay Watershed to account for additional funding needs. Through the Delaware Conservation Partnership, responsible agencies meet quarterly to discuss issues or targeted or prioritized efforts, needs and funding. The Partnership is made up of representatives from NRCS, DDA, DNREC, US Fish and Wildlife, the Conservation Districts, Nutrient Planning Companies, and others. An example of recent NRCS funding change that resulted from the Conservation Partnership is an amendment of the EQIP funding of the cover crop cost share program to an annual contract rather than through a three year contract. This simple amendment made the program more attractive to participants and garnered additional interest in 2010 cover crop planting. Through the Conservation Partnership, additional resources will be pursued to accommodate the increased goal of BMP implementation within the Chesapeake Watershed as highlighted within this document.

As additional funding needs will certainly be warranted, private grants and/or exploratory grants will be additionally pursued. Lastly, to accommodate easier land owner participation by Private Landowners, the State of Delaware, Revolving Loan Fund Program should be review and expanded to allow additional BMP funding as applicable.

Table 55: Summary of Current Agriculture Funding Sources and Future Need By Grant Program

Program	Chesapeake Bay Annual Budget (2009)	Funding Needs
9.1.1.2 Nutrient Planning Program	\$172,436	
9.1.1.3 Nutrient Relocation Program	\$286,529	Yes
9.1.1.4 Kent County Conservation District Cost Share	\$287,856	\$425,000
9.1.3 Sussex Conservation District Cost Share Program	\$805,411	\$3,164,701
9.1.4 New Castle Conservation District Cost Share Program	\$150,000	Yes
9.1.5 Agriculture Management Assistance Program	\$60,000	
9.1.6 Wetland Reserve Program	\$215,000	
9.1.7 Wildlife Habitat Incentives Program	\$100,000	

9.1.8 Environmental Quality Incentives Program (EQIP)	\$1,787,055	
9.1.9 Chesapeake Bay Watershed Initiative (CBWI)	\$1,020,093	\$3,880,665
9.1.10 Delaware Conservation Reserve Enhancement Program (CREP)	\$93,347	
9.1.11 Conservation Reserve Program (CRP)		
TOTAL	\$4,692,013	\$7,470,366

- Implementation of CAFO Program at the Department of Agriculture's Nutrient Management Program, including staff to conduct compliance inspections, monitoring, outreach, data collection and technical assistance related to permit development and compliance. As of 3/2012, approximately 400 CAFO NOIs have been submitted and one CAFO permit issued statewide. CAFO staff at DDA has also identified additional operations that may qualify for permits in the future and outreach will be needed to work with those property owners. Funding from the CBRAP has been provided to hire a temporary staff person at DDA to assist with this program; however additional funds will be needed for long term implementation.
- Expand Farm Land Preservation Program – in order to adequately fund state Agricultural Lands Farmland Preservation Program and the Young Farmer's Agland Preservation Program up to \$10,000,000 is needed annually. Well over half of the funds to date have been expended in the Chesapeake Bay Watershed.
- Improved data management system and BMP tracking

Table 56: Summary of BMP Funding Needs for Increased Implementation of Agriculture Practices to Achieve TMDL

BMPS: PRIVATE LANDS	Funding Needed for Full Implementation	Funding Mechanism
Traditional Cover Crops	\$1,002,000-2,004,000 annually	Cost-Share State Conservation Cost Share, Farm Bill Programs, EPA /CBP Funding.
Commodity Cover Crops	\$922,775 - \$1,318,250	Cost-Share State Conservation Cost Share, Farm Bill Programs, EPA /CBP Funding.
Nutrient Management Compliance	TBD	Regulatory
Soil Conservation and Water Quality Plans	\$0	Cost-Share State Conservation Cost Share, Farm Bill Programs, EPA /CBP Funding.
Conservation Tillage	\$3,279,770	Cost-Share State Conservation Cost Share, Farm Bill Programs, EPA /CBP Funding.
Continuous Conservation No-Tillage	\$1,446,360	Cost-Share State Conservation Cost Share, Farm Bill Programs, EPA /CBP Funding.

Decision/Precision Agriculture	\$2,936,430	Cost-Share State Conservation Cost Share, Farm Bill Programs, EPA /CBP Funding.
Livestock Waste Structures	\$2,310,000	Cost-Share State Conservation Cost Share, Farm Bill Programs, EPA /CBP Funding.
Water Control Structures	\$75,000	Cost-Share State Conservation Cost Share, Farm Bill Programs, EPA /CBP Funding.
Stream Protection With Fencing	\$3,000	Cost-Share State Conservation Cost Share, Farm Bill Programs, EPA /CBP Funding.
Stream Protection Without Fencing	\$227,500	Cost-Share State Conservation Cost Share, Farm Bill Programs, EPA /CBP Funding.
Upland Prescribed Grazing		Cost-Share State Conservation Cost Share, Farm Bill Programs, EPA /CBP Funding.
Manure Relocation	\$478,470	Cost-Share State Conservation Cost Share, Farm Bill Programs, EPA /CBP Funding.
Poultry Waste Structures	\$7,534,395	Cost-Share State Conservation Cost Share, Farm Bill Programs, EPA /CBP Funding.
Runoff Control Systems	\$1,344,000	Cost-Share State Conservation Cost Share, Farm Bill Programs, EPA /CBP Funding.
Mortality Composters	\$1,217,712	Cost-Share State Conservation Cost Share, Farm Bill Programs, EPA /CBP Funding.
Large Animal Mortality Program	\$840,000	Cost-Share State Conservation Cost Share, Farm Bill Programs, EPA /CBP Funding.
Streamside Grass Buffers	\$538,904	Cost Share through CREP
Streamside Forest Buffers	\$2,958,318	Cost Share through CREP
Wetland Restoration	\$3,209,968	Cost-Share State Conservation Cost Share, Farm Bill Programs, EPA /CBP Funding.
Shoreline Erosion Control		Cost-Share State Conservation Cost Share, Farm Bill Programs, EPA /CBP Funding.
Retire Highly Erodible Lands		Cost-Share State Conservation Cost Share, Farm Bill Programs, EPA /CBP

		Funding.
Land Retirement		Cost-Share State Conservation Cost Share, Farm Bill Programs, EPA /CBP Funding.
Forest Harvesting Practices		Cost-Share State Conservation Cost Share, Farm Bill Programs, EPA /CBP Funding.
SUBTOTAL	\$30,324,602	
BMPS: PUBLIC LANDS		
Tree Planting	\$43,200	Cost-Share State Conservation Cost Share, Farm Bill Programs, EPA /CBP Funding.
Wetlands Restoration	\$25,530	Cost-Share State Conservation Cost Share, Farm Bill Programs, EPA /CBP Funding.
Streamside Forested Buffers	\$12,750	Cost-Share State Conservation Cost Share, Farm Bill Programs, EPA /CBP Funding.
Streamside Grass Buffers	\$22,500	Cost-Share State Conservation Cost Share, Farm Bill Programs, EPA /CBP Funding.
Ag Strategies on DNREC/DDA Lands		Cost-Share State Conservation Cost Share, Farm Bill Programs, EPA /CBP Funding.
Natural Filters on Other Public Lands	\$225,000	Cost-Share State Conservation Cost Share, Farm Bill Programs, EPA /CBP Funding.
SUBTOTAL	\$328,980	
NEW FARMING PRACTICES		
CAFO Setbacks		Regulatory
Cropland Irrigation Management		Private
Vegetative Environmental Buffers	\$600,000	Cost-Share State Conservation Cost Share, Farm Bill Programs, EPA /CBP Funding. Delmarva Poultry Industry, Inc.
Streamside/Tax Ditch Restoration	\$1,762,500	Cost-Share State Conservation Cost Share, Farm Bill Programs, EPA /CBP Funding.
SUBTOTAL	\$2,362,500	
EVOLVING PRACTICES		
Phosphorus-sorbing materials		Private or Exploratory Grants
In-house poultry ammonia		Private or Exploratory Grants

emission control		
Agronomic Improvements		Private
Voluntary Practices		Private
Carbon Sequestration/Alternative Crops		Private or exploratory grants
Alternative Use of Manure		Private or exploratory grants
Revised Phosphorus Index for Nutrient Management Planning		Private or Exploratory Grants
Dairy Manure Incorporation technology		Private or Exploratory Grants
Poultry manure incorporation technology		Private or Exploratory Grants
Windrowing		Private or Exploratory Grants
Poultry House Remediation		Private or Exploratory Grants
TOTAL COST SHARE REQUIRED TO ACHIEVE 2025 GOALS	\$33,016,082* (2010)	COST SHARE DOLLARS
*Costs for some practices are currently unknown.		

Communications and Outreach

The Communications Team requires funding to implement the WIP Communication and Marketing Plan, including providing a part time staff person to provide outreach assistance to various programs, media assistance including press releases, social media, etc. and develop and participate in public outreach events. Funding for one year has been provided through a combination of the CBRAP and CBIG grants; however additional funding will be needed for long term implementation.

Restoration

Funding is provided incrementally through grants such as CBIG and NFWF as well as through Agriculture Cost Share. A consistent funding source is needed to meet our restoration goals identified in the WIP. Currently funds have been provided by the CBIG and NFWF grants for these efforts and through cost share provided by agriculture programs. Future funding sources may include a Nutrient Offset program, and/or DeIDOT mitigation program funds.

- Revamped tracking database for ecological restoration projects.
- Cost Share Funding for on the ground restoration for private landowners (see Ag and/or urban sections).
- Restoration of channelized streams and wetlands (see Ag and/or urban sections).

Table 57: Summary of Funding Needs for Implementation of Delaware WIP*

Source Sector	Projected Annual Costs ⁴⁴	Projected Capital Costs
Wastewater (NPDES)	\$2,140,000	\$29,000,000 ⁴⁵
Onsite Wastewater	\$225,000	0
Stormwater	\$183,000	\$140,789,000 ⁴⁶
Landuse	\$70,000	\$357,000
Agriculture	\$5,076,000 ⁴⁷	\$33,016,082 ⁴⁸
Restoration ⁴⁹		
Communications	\$22,500	
Monitoring	\$230,000	
TOTAL	\$7,946,500	\$203,162,082

*Funding needs will be updated regularly. There are many costs that have not been assessed at the time of this submission.

Funding for the implementation of the WIP comes from a variety of sources, including federal grant funds from EPA, USDA, and USFWS. We also receive state general funds which are used for staffing and to match federal grants. Additional funds are obtained by various partners and agencies from non-profit partners and local government partners in the form of grants, in-kind and cash match. Any reduction of state and/or federal funding for programs related to implementation of the WIP will affect Delaware's ability to implement the WIP to achieve TMDL goals. The annual and capital funds identified in Table 57 constitute some new and future annual costs that are not currently budgeted as well as program areas that may be funded now through short term sources. Table 55 identified current known funding sources. Those funding sources are not all guaranteed on an annual basis and funds have been reduced and are anticipated to be reduced annually through 2017.

15.3 Economic Value

The University of Delaware's Water Resources Agency developed a report documenting the socioeconomic value of the Chesapeake Bay Watershed in Delaware. The reports states that the Chesapeake Bay Watershed in Delaware contributes over \$2 billion in annual economic activity from benefits associated with water quality, water supply, ecotourism, recreation, agriculture, forest, open space, and navigation. An annual ecosystem value of \$3.4 billion (2010 dollars) from natural goods and services is provided by the watershed. In addition, the watershed is responsible for 47,000 jobs worth \$1.2 billion in annual salaries. While it will take significant resources to achieve the water quality goals of the TMDL and this WIP, the data

⁴⁴ Projected annual costs does not take into account current staff effort expended through various programs to develop and implement programs. This constitutes additional funds that are needed to adequately implement the WIP.

⁴⁵ Accounts for Bridgeville and Greenwood only

⁴⁶ \$489,000 of this will be funded by current CBRAP allocation.

⁴⁷ Includes \$5,000,000 for Agland Preservation and Young Farmer's Programs.

⁴⁸ Cost Share funding for full implementation of Ag BMP goals. Some practices included in this category may be annual costs.

⁴⁹ Funding is provided incrementally through grants such as CBIG and NFWF as well as through Agriculture Cost Share.

presented in this report show that the Chesapeake is already a valuable resource worthy of protection and by doing so, its value will further increase. The final report is available as Appendix I to this WIP.

15.4 Milestones

- DNREC and DDA will continue to coordinate with the NRCS State Conservationist to develop a plan to better leverage USDA Farm Bill funding with existing state cost share programs.
- EPA is working to identify costs associated with the Chesapeake Bay TMDL by end of CY2012. Delaware will review EPA's analysis and further develop and refine the estimate of the annual and total costs associated with achievement of the TMDL goals and milestones through 2025 and 2017 according to the approved WIP.
- Coordinate and leverage restoration expenditures with the Forest Service, NRCS, DelDOT, mitigation funds, in-lieu funds, penalty funds, etc.
- Develop a comprehensive list of funding sources including grants, loans, etc for partners (2012).
- Develop a prioritization tool to assist decision makers better direct funding, including the future CBRAP and Implementation grants to achieve WIP goals and milestones.
- Develop a mechanism to track annual spending in the Chesapeake Watershed on an annual basis through collaboration and cooperation from local, state, federal and nonprofit agencies.
- Work with partners, including local governments, non-profit partners, and partner agencies to develop and submit grant applications for implementation of water quality projects. (On-going).

SECTION 16.

DATA AND MODEL ISSUES AND CONCERNS

While Delaware has and will continue to support the TMDL and WIP efforts, there are several issues related to the modeling exercise that cause concern and should be identified so that these issues can be addressed in future versions of the model. The model is used to not only calculate necessary load reductions to achieve water quality goals, but it also used to assess progress toward those goals. Therefore, it is imperative that the data and assumptions utilized are appropriate, do not disproportionately impact one jurisdiction or pollutant sector, and accurately reflect the impacts of implemented actions. Staff from DNREC, DDA, and other local partners appreciate the assistance received from Chesapeake Bay Program modelers and look forward to a continued dialogue on the issues discussed below.

16.1 On-site Wastewater

Several different types on onsite wastewater treatment and disposal systems are currently in use throughout Delaware. The Large Systems Branch reviews and approves spray irrigation wastewater systems and on-site wastewater treatment and disposal systems with daily flows greater than 2,500 gpd, Innovative/Alternative Technologies, Advanced Treatment Units, underground injection wells, and other means associated with land application of treated wastewater. Currently, these types of larger systems that treat businesses and multiple homes are not captured in the Chesapeake Bay watershed model; rather, all onsite is assumed to be individual standard systems. This has implications for Delaware as the level of treatment achievable by these larger systems exceeds the level of treatment provided by individual standard systems. Therefore, a portion of the onsite wastewater loads from Delaware are likely less than those being modeled. The DNREC Ground Water Discharges Section (GWDS) will work with the Chesapeake Bay Program to address this issue when model recalibration occurs prior to 2017.

16.2 Stormwater

With respect to urban stormwater, potential sources of error in the Phase 5 model include:

- Land use classification data for the urban sector
- Urban stormwater BMP data
 - Currently, stormwater BMPs are grouped into several broad categories and modeling of more specific types of practices may be more appropriate;
 - Source reduction (hydrology) BMPs for the urban stormwater environment, which are promoted as environmentally best, should be more specifically modeled;
- Stormwater runoff estimates for the urban sector

Initial analysis of the latest Input Deck runs indicated discrepancies in all three of these areas when compared to local sources, as was noted in the Phase I WIP. For example, the urban land area used in the model was significantly less than the Delaware State Planning Office's 2007 land use and land cover (LULC) geographic information system (GIS) data indicates. The acres of urban lands managed by stormwater BMPs were also known to be under-counted in the model. In addition, the pollutant loading calculated by the model for the urban sector appeared to be significantly higher than would be expected for the inputs used. The net effect of these apparent discrepancies leads to uncertainty in the modeling results. Improved land use data collection methods in the latest model appear to be closer to local land use data. In addition, the State has provided updated stormwater BMP data to be input into the most recent model runs. As a result, the pollutant loadings attributed to urban sources in the Chesapeake are getting closer to those expected based on local data, although some discrepancies still exist.

According to the latest official LULC data from 2007, lands that fall under the urban categories account for about 10% of the overall lands in the Chesapeake Bay drainage of Delaware. The modeled urban loadings for TN and TP appear to be consistent with the LULC data. However the TSS loadings indicate fully 1/3 of the total sediment load is attributed to the urban sector. It would require event mean concentration (EMC) values that are an order of magnitude greater than those typically used for urban sources to get loading values of that magnitude at the site level. While it's understood that the TSS loading algorithms take in-stream sources into account as well, the urban development in Delaware's portion of the Chesapeake drainage is predominately low density residential (approximately 75%) with disconnected impervious areas. The majority of the road system is disconnected as well, since it is drained through open channels rather than storm drains. In addition, the Coastal Plain streams are very low gradient and do not exhibit the same scouring problems seen in Piedmont watersheds. Although stream bank erosion can be observed in Delaware's Coastal Plain segments, particularly in the tidal sections, it is difficult to understand how this can be attributed so disproportionately to urban sources having a total watershed imperviousness of only 4%-6%. The State will continue to coordinate with EPA and Chesapeake Bay Program modelers to ensure the most accurate data is used in the Phase 5 model in future runs in order to validate the results of any gap analyses.

Although the Chesapeake Bay Phase 5 model has some capability to account for the benefits of newer Green Technology practices, they are not explicitly modeled as runoff reduction practices. EPA's Scenario Builder spreadsheet tool is used as the interface between BMP data collected by the states and the pollutant reductions as predicted by the Phase 5 model. It is felt that the BMP classifications used in the model will need to expand in order to measure the true benefit of Delaware's Green Technology practices and runoff reduction objectives.

Additionally, while source controls would be far more cost effective than retrofitting urban stormwater practices, their benefits are not as well accounted for in the P5 model. Delaware would like to work more closely with EPA and the Chesapeake Bay modelers to ensure these benefits will be adequately credited in its overall strategy to reduce pollutant loads to the Chesapeake Bay.

Finally, the following BMPs are not currently captured in Scenario Builder and the model and Delaware plans to work to ensure these practices are appropriately credited in the future:

- Rainwater Harvesting
- Impervious Disconnection
- Soil Amendments
- Vegetated Roofs
- Spill Prevention and Response
- Educational BMPs

16.3 Land Use

Urban fertilizer usage: In this Phase II WIP, Delaware has provided data demonstrating the substantial decrease in non-farm phosphorus fertilizer sold in this state over the last 10 years. Delaware is participating with the Urban Fertilizer Management Panel and has successfully requested that the panel

include in their charge considering “credit for jurisdictions without a P Ban, but all available lawn fertilizers comply with standards set by surrounding jurisdictions with P Bans.”

Land change modeling: According to the Chesapeake Bay Program:

“The Chesapeake Bay Land Change Model analyzes and forecasts urban land uses and populations on sewer and septic systems in the watershed. The forecasts are based on reported changes in housing, population and migration from the U.S. Census Bureau, land cover trends derived from satellite imagery; sewer service areas; and county-level population projections. Conversion of farmland and forest land to development is based on a thorough examination of urban development and land conversion trends derived from satellite imagery dating back more than 25 years.”

Delaware commends the Bay Program on their efforts to forecast population and land use changes; however, earlier analyses of results from this model predicted levels of growth contrary to local expertise. DNREC in cooperation with the Office of State Planning Coordination and the University of Delaware are working with local communities to document their plans for future growth in our own Community Land Use Model. Delaware is eager to share the results of this work and to continue providing reviews and feedback into the Bay Program model.

16.4 Agriculture

Phosphorus Based Nutrient Management Plans: Delaware utilizes phosphorus based nutrient management plans; however, the model is not currently able to accurately reflect P-based planning. DNREC and DDA staff will work with Bay Program modelers to correct this issue in the future.

Decision Agriculture: According to the Scenario Builder definition for this practice, nutrient management plans developed in accordance with Delaware's Nutrient Management Law and Regulations already meet this definition, yet, Delaware has only been getting credit for standard planning. DNREC and DDA staff would like to discuss the necessary steps to obtain the additional credit and transition our data reporting appropriately.

AFO/CAFO Breakout: During the Phase I WIP process, Delaware estimated the number of animal operations within the Chesapeake and provided EPA with the number by subwatershed that should be considered an AFO and those that should be a CAFO. It appears however that EPA relied on the number of operations that had officially submitted a Notice of Intent (NOI) for a CAFO permit by February 2009 to calculate the loads from Delaware CAFO operations and those values were aggregated and included as a WLA in EPA's December 29, 2010 TMDL.

Since the Phase I WIP and the TMDL, EPA has made some model updates and CAFO data was included. According to communications with the modeling staff, 2009 and 2010 animal data reflect an extrapolation from 2007 agriculture census data. The numbers of operations or animals provided by the states were incorporated as a percentage of the total animals to be attributed to CAFOs and the WLA. State data was summed to the county scale to match Scenario Builder's agriculture census data and applied to the agriculture census total. Upon reviewing this new data, members of the Agriculture Subcommittee are uncertain if this methodology is accurately reflecting the true AFO/CAFO breakout in Delaware and will continue to work with EPA to make any necessary corrections.

Manure Volume and Nutrient Content: Delaware has manure analysis data which indicates that both the poultry manure volume and nutrient content used in the model should be corrected. Delaware is leading a special task force of the Chesapeake Bay Program Ag Working Group to assess this situation further and make recommendations to the Ag Working Group and then to the Water Quality Goal Implementation Team. The example below illustrates the difference. This has implications on agriculture loading rates in Delaware and goals related to our manure relocation program.

	EPA/ASAE Approach	units
Bird Inventory	43,620,576	# of birds on any given day (2007 Census)
Animal Unit Definition	455	# of birds per 1000 lbs of animal mass
Total Animal Unit Inventory	95,869	animal units on any given day
Manure Production	85	lbs of manure per animal unit per day
Total Manure Produced	1,487,174	tons wet excretion per year
Nitrogen Concentration	0.0129	lbs TKN per lb of manure
Phosphorous Concentration	0.0035	lbs Total P per lb of manure
Total Nitrogen Produced	38,491,563	lbs Total N per year
Total Nitrogen Not Volatized	35,332,221	lbs Total N per year
Total Phosphorous Produced	10,497,699	lbs Total P per year
Total Phosphorous Produced with 16% phytase credit	8,818,067	lbs Total P per year

	UD/DDA/UMD Approach	units
No of Birds	43,620,576	# of birds
No of Flocks per Year	4.8	flock per year
Total Number of Birds Produced	209,378,765	birds per year
Manure Production	1.25	tons per 1000 birds
Total Manure Produced	261,723	tons per year
Nitrogen Concentration	56.80	lbs Total N per ton
Phosphorous Concentration	19.50	lbs Total P per ton
Total Nitrogen Produced	14,839,720	lbs Total N per year
Total Phosphorous Produced	5,103,607	lbs Total P per year

16.5 Restoration

Wetland restoration: The model currently treats wetland restoration as a land use change BMP that can only occur on agricultural lands. The Restoration Workgroup, however, established significant goals in our Phase I WIP for restoring drained forested wetlands. This type of practice reestablishes altered hydrology and reconnects the stream channel to the floodplains, allowing nutrient retention and uptake. The Chesapeake Bay Program modeling group has instructed Delaware to report this type of wetland restoration on the hay without nutrient land use until the Forestry and Watershed Technical Workgroup can consider an alternative credit system.

16.6 Federal Lands

During the Phase I WIP process, Delaware was provided with land use acreages and associated loads for the federal lands within the Chesapeake. Upon further review, it appears that these acreages and loads are not accurate and were likely estimated by extrapolating land use acreages at a larger watershed or county scale to the federal areas. This has implications as the federal partners expect an allocation from the state jurisdictions. In order for Delaware to provide the Army National Guard Reserve with an allocation, the existing loads from these lands must be determined.

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WEB LINKS

7103 Guidance and Regulations Governing the Land Treatment of Wastes:

<http://regulations.delaware.gov/AdminCode/title7/7000/7100/7103.pdf>

Surface Water Discharges Section: Board of Certification for Wastewater Operators:

<http://www.wr.dnrec.delaware.gov/Services/OtherServices/Pages/SurfaceWaterDischargesLicensing.aspx>

Groundwater Discharge Section:

<http://www.wr.dnrec.delaware.gov/Services/Pages/GroundWaterDischarges.aspx>

Delaware Code, Ch. 60, Title 7: <http://delcode.delaware.gov/title7/c060/sc02/index.shtml>

Simply Septics: <http://www.dnrec.state.de.us/water2000/Sections/Watershed/ws/simplyseptic2006web.pdf>

Regulations Governing On-Site Wastewater Treatment and Disposal Systems:

<http://www.wr.dnrec.delaware.gov/INFORMATION/GWDINFO/Pages/Regulations%20Governing%20On-Site%20Wastewater%20Treatment%20And%20Disposal%20Systems.aspx>

Groundwater Discharges Section:

<http://www.wr.dnrec.delaware.gov/Services/Pages/GroundWaterDischarges.aspx>

Groundwater Discharges Section: Regulations:

<http://www.wr.dnrec.delaware.gov/Information/regulations/Pages/GroundWaterDischargesRegulations.aspx>

ICIS: <http://www.epa.gov/compliance/data/systems/icis/index.html>

Green Technology:

<http://www.dnrec.state.de.us/DNREC2000/Divisions/Soil/Stormwater/PDF/Green%20Technology.pdf>

Sediment and Stormwater Reductions: <http://regulations.delaware.gov/AdminCode/title7/5000/5101.shtml>

Planned Revision to Reductions:

<http://www.swc.dnrec.delaware.gov/Drainage/Documents/Sediment%20and%20Stormwater%20Program/Reg%20Revisions/2nd%20Draft%20May%202010%20-%20Clean%20Version.pdf>

SWDS Stormwater Program:

<http://www.wr.dnrec.delaware.gov/Information/SWDInfo/Pages/SWDSStormWater.aspx>

General Permit Program:

<http://www.wr.dnrec.delaware.gov/Information/SWDInfo/Documents/Section%209.1-%20GSWP%20Reg.pdf>

Kent County Conservation District: <http://kentcd.org/>

Sussex County Conservation District: <http://sussexconservation.org/index.htm>

New Castle Country Conservation District: <http://newcastleconservationdistrict.org/>

Nutrient Management: <http://dda.delaware.gov/nutrients/index.shtml>

Nutrient Management Relocation:
http://dda.delaware.gov/nutrients/forms/2008/081208_NMRPGuidelinesREV.pdf

Agriculture Week: <http://www.rec.udel.edu/AgWeek/home.htm>

Tax Ditch Channels: <http://www.swc.dnrec.delaware.gov/Drainage/Pages/TaxDitches.aspx>

ACRONYMS AND ABBREVIATIONS

Acronym	Meaning
AFO	Animal Feeding Operation
AMA	Agricultural Management Assistance
BAT	Best Available Technology
BMP	Best Management Practice
BNR	Biological Nutrient Removal
CAFO	Concentrated Animal Feeding Operation
CBP	Chesapeake Bay Program
CBRAP	Chesapeake Bay Regulatory and Accountability Grant
CBWI	Chesapeake Bay Watershed Initiative
CGP	Construction General Permit
CNMP	Comprehensive Nutrient Management Planning
CREP	Conservation Reserve Enhancement Program
CRP	Conservation Reserve Program
CWA	Clean Water Act
DDA	Delaware Department of Agriculture
DELIP	Delaware Landowner Incentive Program
DelDOT	Delaware Department of Transportation
DMR	Discharge Monitoring Regulations
DNMC	Delaware Nutrient Management Commission
DNREC	Department of Natural Resources and Environmental Control
DOSPC	Delaware Office of State Planning Coordination
ENR	Ecological Nutrient Removal
EPA	Environmental Protection Agency
EQIP	Environmental Quality Incentives Program
ERES	Exceptional Recreational or Ecological Significance
FWS	Fish and Wildlife Services
GTBMP	Green Technology Best Management Practice
GWDS	Ground Water Discharge Section
ICIS	Integrated Compliance Information System
KCD	Kent Conservation District
LA	Load Allocations
MOS	Margin of Safety
MOA	Memorandum of Agreement
MS4s	Municipal Separate Storm Sewer Systems
NACDNET	National Association of Conservation Districts

NCCD	New Castle Conservation District
NCCDE	New Castle County
NEIEN	National Environmental Information Exchange Network
NMA	Nutrient Management Act
NMC	Nutrient Management Commission
NML	Nutrient Management Law
NMP	Nutrient Management Plan
NPDES	Nonpoint Discharge Elimination System
NPS	Nonpoint Source Pollution
NRCS	Natural Resources Conservation Districts
NOV	Notice of Violation
NOI	Notice of Intent
OMB	Office of Management and Budget
OWTDS	Onsite Wastewater Treatment Disposal Systems
PCS	Pollution Control Strategy
PLUS	Preliminary Land Use Service
PS	Point Source Pollution
SGCN	Species of Greatest Conservation Needs
SCD	Sussex Conservation District
STP	Sewage Treatment Plant
STS	State Technical Standards
SWDS	Storm Water Discharge Section
SWQS	Surface Water Quality Standards
TAT	Tributary Action Team
TMDL	Total Maximum Daily Load
TN	Total Nitrogen
TP	Total Phosphorous
TSS	Total Suspended Solid
USDA	United States Department of Agriculture
USFWS	U.S. Fish and Wildlife Services
WHIP	Wildlife Habitat Incentive Program
WIP	Watershed Implementation Plan
WRP	Wetland Reserve Program
WLA	Waste Load Allocation
WQS	Water Quality Standard
WWTP	Wastewater Treatment Plant

APPENDICES

Appendix A – Public Talk, Real Choices, Real Strategies

Appendix B – Interagency Workgroup and Subcommittee Members

Appendix C - Delaware's Nonpoint Source Best Management Practice Implementation Data Quality Assurance Project Plan

Appendix D – Seaford's Washington Street Stormwater Retrofit Project

Appendix E – DRAFT – The Modeling of Land Use Activities within the Delaware Segment of the Chesapeake Bay Watershed

Appendix F – Scope of Work: Modifying Delaware's Nutrient Budget Protocol for Use as an Offset Tracking Tool in the Chesapeake Bay Watershed

Appendix G – 2017 and 2025 Implementation Levels of Agriculture BMPs

Appendix H – Nutrient Management Annual Report Form for the Choptank Watershed

Appendix I – Socioeconomic Value of the Chesapeake Bay Watershed in Delaware

Appendix J – Nonpoint Source Best Management Practice Efficiency Table

Appendix K – Municipal Ordinance Review Memos

Appendix L – Municipal Model Ordinance Review Memo